



Happy teacher, healthy class? Linking teachers' subjective well-being to high-school and university students' physical and mental health in a three-level longitudinal study

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Abstract

This study focused on the relationships between teachers' subjective well-being, perceived teacher support and students' subjective mental and physical health. We surveyed students at the beginning, halfway, and at the end of the second semester, collecting 1230 observations clustered within 410 students. Additionally, 66 of their teachers rated their subjective well-being (teaching self-efficacy and life satisfaction) at the beginning of the semester. We used multilevel modeling to link teachers' subjective well-being to students' health and perceived teacher support, controlling for the effects of time. Teaching self-efficacy positively predicted students' mental health. Moreover, perceived teacher support had a positive association with both subjective physical and mental health reported by students across the semester. We found inconclusive results in testing the associations between teachers' subjective well-being and perceived teacher support. We also found non-significant associations between teaching self-efficacy and students' physical health, as well as life satisfaction and students' mental health.

Keywords Student health · Perceived teacher support · Teacher self-efficacy · Teacher life satisfaction · Multilevel

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1 Introduction

Recent re-conceptualizations of education expanded the role of the teacher from merely developing knowledge to contributing to the development of students' social and emotional skills and to maintaining student well-being (Braun et al., 2020; Jennings & Greenberg, 2009). This perspective has placed teachers on the front line of sustaining and preserving the physical and mental health of their students (Denny et al., 2011). Aligned with this direction, global theories of student well-being, such as the Prosocial Classroom Model (Jennings & Greenberg, 2009) emphasize the importance of teachers' occupational health and well-being in explaining and maintaining students' well-being (Braun et al., 2020). According to this theory, teachers' well-being and socio-emotional competence are associated with student well-being through (1) the development of supportive teacher-student relationships, (2) effective classroom management strategies, and (3) the role model of desired social and emotional behavior that the teacher represents for his/her students (Jennings & Greenberg, 2009). Through these mechanisms, teachers' subjective well-being (SWB) becomes an important piece in the dynamics of student health and SWB (Braun et al., 2020; Harding et al., 2019).

The current literature on this topic focused on the quality of student-teacher relationships, which connects teachers' SWB to student outcomes (Jennings & Greenberg, 2009). In this study, we have collected student reports of perceived teachers support (PTS), following the definition of teacher support as the degree of emotional and instrumental help offered by the teacher (Federici & Skaalvik, 2014). Previous research suggested that PTS is an essential resource in the educational setting (Plenty et al., 2014). Empirical investigations concluded that students who feel that their teachers are involved and care for their well-being are also more engaged and motivated (Pap et al., 2021), experience better mental health (Conner et al., 2014; Mizuta et al., 2016) and physical health (Dudovitz et al., 2016). However, most of this research focused mainly on younger students, and we know relatively less about the nature and effects of supportive student-teacher relationships in higher education. Hagenauer and Volet (2014) argued that research on this relationship should be extended to university settings, where it is a greatly understudied topic with great potential in understanding how supportive professors can influence a wide range of student outcomes.

Surprisingly, we also have limited knowledge about the ways teachers' SWB relates to students' perceptions of their teachers' supportiveness (Phillippo & Stone, 2013), and even less about its relations to students' subjective health and well-being (Braun et al., 2020). Most of the research conducted so far has adopted a cross-sectional approach which does not assess the evolution of students' well-being during the semester or the factors that can explain this evolution. Although recent research suggested that students experience a decrease in well-being as the semester unfolds (Maricuțoiu & Sulea, 2020), little is known about how these evolutions are associated with PTS or with teachers' SWB.

1.1 The role of teacher well-being in predicting student health

Teachers' SWB has become an important point of investigation in understanding students' well-being, as emphasised by a recent systematic literature review by Madigan and Kim (2021), who reported relationships between teachers' burnout is related to students' SWB. According to the Prosocial Classroom Model (Jennings & Greenberg, 2009), teacher well-being can influence student outcomes not only through its' influence over the classroom environment but also through the role model of social and emotional behavior that teachers represent. When teachers are unsatisfied or lack self-efficacy, they are not only less capable of creating a learning environment that is warm and welcoming for students, but students absorb and mirror the negative physical and emotional reactions that such teachers express during instruction (Braun et al., 2020; Jennings & Greenberg, 2009; Sinclair & Ryan, 1987).

In the present study, we followed widely acknowledged perspectives of subjective well-being (Ryan & Deci, 2001) conceptualizing teachers' SWB as having two fundamental components: hedonism (i.e., the subjective experience of happiness and life satisfaction), and eudaimonia (i.e., positive mental health and self-realisation). In their seminal work, Ryan and Deci (2001) described hedonism through a focus on happiness, in terms of experiencing pleasure and avoiding pain. They conceptualized eudaimonia as the degree to which a person is fully functioning through being autonomous, competent, and having meaningful relationships with others. This approach to investigating SWB among teachers and employees at large has been embraced by several studies not only at the advent of Ryan and Deci's theory but also by more recent work (i.e., Capone & Petrillo 2020; Czerw, 2019; Harding et al., 2019).

We approached teachers' life satisfaction from the perspective advanced by Diener (2000), who defined it as a cognitive process of assessing the quality of life based on personal criteria. Contrary to great attention paid to the ways life satisfaction and generally being happy relates to work performance and positive relations at the workplace (Erdogan et al., 2005), the effects of teachers' life satisfaction on the way they relate to, and influence students, have been greatly understudied (Braun et al., 2020). We believe that the current literature holds some complementary results that have not been connected yet in empirical research. On the one hand, research indicated that students outperform their peers in terms of their yearly academic achievement when their teachers experience high life satisfaction (Duckworth et al., 2009). On the other hand, achievement has been cross-sectionally linked to physical health among students both in adolescence (Wade et al., 2000), and in higher education (Ong et al., 2021). The possible link between teachers' life satisfaction and student health can also be inferred from the Prosocial Classroom Model (Jennings & Greenberg, 2009), which postulated that students follow the role model of social and emotional competence that teachers represent. Hence, when students interact with teachers who express happiness and contentment with life, they also are likely to follow this model and feel more satisfied. In turn, higher life satisfaction among students has been associated with better physical health indices (Zullig et al., 2005). The existing empirical investigations directly linking teachers' life satisfaction to student outcomes yields a rather incomplete view. While Duckworth and colleagues (2009) have reported significant associations to achievement, Braun and colleagues (2020) did not find an

association between teachers' life satisfaction and the development of elementary school-children's emotional well-being, but found a significant effect on increased prosocial behaviors within the classroom.

Teaching self-efficacy (TSE; Tschannen-Moran & Hoy 2001) taps into teachers' beliefs in their ability to design, organize and implement instructional activities with success, representing the positive relationships and competency components of eudaimonia (Ryan & Deci, 2001). TSE has plenty of known implications for the quality of instruction (Zee & Koomen, 2016), and for the quality of teacher-student relationships (Phillippo & Stone, 2013). Although the importance of TSE is well-established in improving various aspects of the teaching process (Künsting et al., 2016; Tschannen-Moran & Hoy, 2001), there is a limited number of studies that connects TSE to student well-being (Zee & Koomen, 2016). In our view, TSE could have an impact on students' mental health through the well-directed and clear goal structure, well-defined expectations, and calm handling of difficult situations in the classroom (Künsting et al., 2016). Although a recent review concluded that TSE could influence student psychological well-being and academic adjustment in lower educational levels (Zee & Koomen, 2016), research in higher educational contexts is almost completely missing on this topic. The existing evidence suggest that older students also feel more anxious during classes where they perceive that their teachers struggle with anxiety and low efficacy (Sinclair & Ryan, 1987). Moreover, teachers with TSE are more successful in creating well-organized, clearly structured and autonomy supportive learning environments in which students' achievement and health can thrive in (Jennings & Greenberg, 2009; Zee & Koomen, 2016). When students feel that their teachers allow them control over aspects of their activity and provide clear explanations regarding the processes behind achieving goals, students reported better physical health and emotional functioning (Tilga et al., 2020). Furthermore, students with higher grades tend to choose healthier options in a wide range of behaviors, such as lower alcohol consumption, healthier eating habits, following healthy sleeping recommendations, and less smoking (Ong et al., 2021).

While these results can represent a starting point to establish some hypotheses, they mostly stem from observed associations in cross-sectional studies, in the most part conducted with younger students. The Prosocial Classroom Model itself is mostly oriented towards explaining phenomena that we know from studying young children (Jennings & Greenberg, 2009). Empirical evidence from early educational stages up to high-school converged to the conclusion that schools with the highest levels of teacher SWB have students with lower levels of depressive symptoms (Denny et al., 2011). Research from secondary schools showed that increased SWB among teachers was associated with higher well-being and less psychological distress among students (Harding et al., 2019). In the higher educational context, existing empirical evidence is scarce. In an early study, Sinclair and Ryan (1987) found that teachers' high anxiety before a lecture had a significant impact on students' anxiety during the lecture and on students' ratings of teacher affect, confidence, and teaching effectiveness after the lecture. To the best of our knowledge, this topic was not previously studied on university students. Therefore, more evidence is warranted to better understand how these constructs relate to each other across different moments in time, and if they also hold true as students get older and pursue higher educational stages.

1.2 The role of teacher SWB in predicting perceived teacher support

Within the Prosocial Classroom Model (Jennings & Greenberg, 2009), teachers' SWB is theorized to have a direct effect on the degree of supportiveness that is created in the learning environment. Within this model, teachers who are well-adjusted and demonstrate high social-emotional competence, are better equipped to respond to students' struggles with a warm and supportive approach. Students perceive teachers to be supportive primarily when they use diverse and best practice teaching strategies, acknowledge and boost students' academic success, demonstrate fairness during interactions with students, and foster a classroom environment in which questions are encouraged (Suldo et al., 2009). In order to meet these needs, a teacher must believe in his/her ability to effectively manage the classroom environment, including student misbehaviour, helping students learn and develop, and involving them in the learning process in a meaningful way (Tschannen-Moran & Hoy, 2001). Empirical evidence shows that highly self-efficacious teachers create a warm classroom environment characterized by responsiveness, enthusiasm, and supportiveness (Zee & Koomen, 2016), with a positive orientation towards mastery goals and better-quality instructional practices (Künsting et al., 2016; Tschannen-Moran & Hoy, 2001).

Life satisfaction and the positive attitude that comes with it can also influence teachers' supportiveness, since it impacts effectiveness especially in jobs that require interacting with others (Erdogan et al., 2012). Being associated with the experience and expression of positive emotions, life satisfaction is potentially an underrated antecedent of positive outcomes at the classroom and student level (Braun et al., 2020). Individuals who are happier in life form attachments to others by treating others better (Erdogan et al., 2012). Meta-analytic results indicate that happy employees perform better at their job, being more creative, dependable, going beyond their formal requirements to help others, and building supportive relationships (Lyubomirsky et al., 2005). In the school context, these aspects can contribute to students' perceptions of a teacher as one who does not only teaching them at high standards, but also is warm, supportive, and cares about others (Duckworth et al., 2009).

1.3 Perceived teacher support and students' subjective health

Students tend to identify and appreciate the ways teachers are involved with them and care for their well-being (Suldo et al., 2009). Within the Prosocial Classroom (Jennings & Greenberg, 2009), supportive teacher-student relationships contribute to a better-quality classroom climate, creating an environment where students develop healthy motivation towards learning and school. This resonates with the rationale of Self-Determination Theory (SDT; Ryan & Deci 2001), asserting that PTS contributes to students' health by satisfying the basic needs for relatedness (e.g., students feel that the teacher cares about their well-being and makes an effort to connect to them), and competence (e.g., students get better results and grow as a result of personalized instructional support).

The available cross-sectional evidence from high-school suggests that PTS is associated with less physical health-risk behaviors among students like drug and alcohol use and suicidal ideation (Dudovitz et al., 2016). These can lead to enhanced

physical health among students who feel supported by their teachers (Conner et al., 2014). Laftman and colleagues (2021) also reported a significant link between higher PTS and better physical health among secondary and high-school students. In terms of mental health, previous research has linked PTS to students' internalizing problems (Conner et al., 2014), depressive symptoms (Mizuta et al., 2016), anxiety and self-esteem (Wit et al., 2011) and negative affect (Suldo et al., 2009). Overall, a large number of cross-sectional studies in secondary school and high-school have consistently shown that students who perceive that their teachers care for their well-being (i.e. are supportive), or have an adult confidant within the school, experience less academic anxiety, internalizing symptoms and physical health problems (Conner et al., 2014). While these studies constitute a valuable knowledge base on the health benefits of PTS, there is a lack of longitudinal and multisource evidence from high school (all measures usually been reported by students or teachers, not both), together with a more severe lack of any kind of evidence from higher education (Hagenauer & Volet, 2014). In one recent longitudinal research, Pap and colleagues (2021) included both high-school and university students in a semester-long investigation. They showed that students at both levels, who reported higher PTS at the beginning of the semester, have also reported higher study-related well-being (i.e., engagement, burnout, and boredom) at the end of the semester.

2 The present study

This study aims to offer responses to three main research questions derived from the above reviewed literature:

1. Is teachers' SWB related to students' subjective mental and physical health across the semester?
2. Is teachers' SWB related to their degree of supportiveness, as perceived by students across the semester?
3. Is PTS connected to high-school and university students' mental and physical health reports across the semester?

The specific hypotheses based on the reviewed theoretical and empirical work on this topic state the following:

H1: Teachers' self-efficacy (H1a) and life satisfaction (H1b) at the beginning of the semester, will predict students' subjective mental health during the semester.

H2: Teachers' self-efficacy (H2a) and life satisfaction (H2b) at the beginning of the semester, will predict students' subjective physical health during the semester.

H3: Teachers' self-efficacy (H3a) and life satisfaction (H3b) will predict students' perceptions of teacher support during the semester.

H4: Perceived teacher support during the semester predicts higher student reported mental (H4a) and physical health (H4b) during the semester.

To answer these questions, we investigated the associations between teachers' SWB and students' self-reported mental and physical health across 3 measurement occasions during a semester (i.e., at the beginning, halfway, and at the end of the

Table 1 Characteristics of the student samples

High-school sample (N=200)					
		Study domain			Total
		Mathematics and informatics	Natural Sciences	Humanities	
Gender	Male	32	31	9	72
	Female	25	65	38	128
Grade	9 th grade	30	28	26	84
	10 th grade	27	68	21	116
Undergraduate sample (N=210)					
		Psychology	Educational sciences	Social Work	
Gender	Male	19	2	1	22
	Female	86	66	36	188
Study year	1 st year	-	68	31	99
	2 nd year	16	-	6	22
	3 rd year	89	-	3	89

second semester) in a student sample composed of high-school and university students. In addition, we investigated the evolution of PTS across the semester and tested its association to teachers' SWB reported at the beginning of the semester. We expected teachers' SWB to predict higher PTS, even when the effects of time (i.e., the moment in the semester) are accounted for. Finally, we tested if PTS is related to students' subjective health reports. We considered previous academic achievement as a potential variable to control, given that this has been linked to higher SWB among students (Steinmayr et al., 2016). Because our student sample was composed of both high-school and university students to aid the generalizability of the results, we also kept educational level under control in our models, to account for the potential effect of differing educational stages.

3 Method

3.1 Sample characteristics

The samples were recruited in two Romanian high-schools and a university, in a large city in the Western area of the country. The undergraduate sample included 210 participants (89.5% women, mean age of 20 years, $SD=2.09$ years). They were in the first (47.1%), second (10.5%) and third year (42.4%) of their studies, in three major domains of the social sciences: Psychology (50%), Educational Sciences (31.9%), and Social Work (18.1%). The undergraduate students were nested in 5 study groups (e.g., Educational Sciences, 2nd year in Psychology, 1st year in Social Work).

The high-school sample included 200 students (64% women, mean age of 15.8 years, $SD=0.76$ years) that were nested in 9 study groups (i.e., classrooms). They were in 9th (42%), and 10th (58%) grade, studying one of three study profiles: Mathematics and Informatics (28.5%), Natural Sciences (48%), and Humanities (23.5%). The sample was drawn from the 9th and 10th grades in order to avoid significant confounding variables that would have been present in the 11th and 12th grades. Since in the later years of high-school Romanian students face the pressure of preparing

for standardised national evaluations that can impact their further career trajectories, we expected that there would be differences in their subjective health that are closely connected to the stress of this stage in their education. Therefore, sampling from grades that do not face these specific stressors aids the generalizability of our results, by excluding sources of strain that are present only in specific years of study.

The teacher sample ($N=66$) included 26 academics (65.4% female) and 40 high-school teachers (70% female). Mean age was 40 years ($SD=7.37$) among the academics, and 45.9 years ($SD=10.13$) among high-school teachers. On average, each teacher included in the present study interacted with 2 study groups.

3.2 Procedure

We collected data in three moments: at the beginning of the second semester (T1; late February), midsemester (T2; April), and at the end of the semester (T3; beginning of June). In total, this yielded a nested data structure with 3 levels: 1230 multiple measurements (L1) nested within 410 students (L2), and students nested within 14 study groups (L3). Teachers and academics completed the questionnaires only at T1, and their individual data were aggregated at the level of the study group. For each of the 14 clusters, we computed the average values of their teacher variables.

We obtained the agreement of the high school headmasters to collect data, and several teachers helped in the process of administering questionnaires during regular class hours. In the University, the study was approved by the dean of the Faculty of Social Sciences and Psychology. Teachers from each department within the faculty offered support to collect the data during classes and completed the teacher questionnaire themselves. Participation was completely voluntary, and confidentiality was assured through self-identifiable codes.

3.3 Measures

Student-level measures included physical health, mental health, perceived teachers' support, and self-reported grade-point average.

Physical health was measured with the four-item General Health Scale from the SF-36 Health Survey (Ware, 1999). An example item is: "My health is excellent." Answers were given on a 5-point scale to 1 (*totally disagree*) to 5 (*totally agree*), higher values representing better physical health. Cronbach's α value across the three waves was 0.76, 0.78, 0.81.

Mental health was measured with the five-item MHI-5 screening test (Berwick et al., 1991). The scale taps into general mental states of psychological calm vs. unrest, and enduring sadness vs. cheerfulness. A positively formulated example item is: "During the past month, how much of the time have you felt calm and peaceful?" An example of a negatively formulated item is: "During the past month, how much of the time have you felt demoralized and sad?". Answers were given on a 6-point scale from 1 (*never*) to 6 (*always*); items 1, 3 and 5 were reverse-scored, hence higher values represent better mental health). Cronbach's α values in the student data were 0.46, 0.68, 0.69 in the three waves. Both health scales have been previously used in Romanian studies (e.g., Bălăceanu et al., 2021).

Perceived teacher support was assessed with 5 items (Van Veldhoven & Meijman, 1994) that measure instrumental support (e.g., “If necessary, can you ask your teacher for help?”), and emotional support (e.g., “Do you feel appreciated by your teachers?”) evaluated on a 5-point Likert scale from 1 (*never*) to 5 (*always*). The scale has been adapted to the educational context and has been used in previous Romanian research (Pap et al., 2021). Cronbach's α values across the three measurements were 0.83, 0.86., 0.89.

Grade-point average (GPA) was self-reported. In the demographics section of the questionnaire, each student was asked to report their GPA from the previous semester. This information was used to statistically control any potential effect of individual differences in academic achievement.

Teacher-level measures included life satisfaction and teaching self-efficacy, and data was collected at the beginning of the semester. *Life satisfaction* was measured using five items developed by Diener et al. (1985). An example item is: “I am satisfied with my life”. Responses were given on a 7-point Likert scale from 1 (*strongly disagree*) to 7 (*strongly agree*). Cronbach's α value is 0.84.

Teaching self-efficacy was assessed with 12 items of the Ohio State teacher efficacy scale (OSTES, Tschannen-Moran & Hoy 2001), which is a multidimensional scale that includes *efficacy for instructional strategies* (e.g. “To what extent can you craft good questions for your students?”), *efficacy for classroom management* (e.g. “How much can you do to calm a student who is disruptive or noisy?”), and *efficacy for student engagement* (e.g. “How much can you do to help your students value learning?”). Responses were given on a 9-point scale from 1 (*totally disagree*) to 9 (*totally agree*). We used an overall teaching self-efficacy score that had an excellent internal consistency ($\alpha=0.92$).

3.4 Analytical approach

First, we conducted preliminary analyses to determine whether our predictors are significantly associated with our criteria. These preliminary analyses involved estimating single-predictor models (i.e., one model for each predictor), in which we estimated the association between each candidate predictor and each outcome. This analysis yielded unstandardized covariance coefficients and their standard errors (Table 4), all estimated after taking into account the 3-level nature of our dataset. Based on these analyses, only significant predictors were used in our subsequent analyses.

Because we used a longitudinal design in which students were nested in classes, we conducted multi-level analyses using the HLM software (Raudenbush et al., 2004). The first level (L1) was represented by the repeated measures nested within students, at the second level (L2) we estimated variability across students in our outcomes, and at the third level (L3) we specified the predictors at the cluster-level (i.e., the averaged teacher variables, education level). We built a separate model for each outcome: perceived teacher support, student mental health, and student physical health. We used full maximum likelihood estimation with robust standard errors, and we introduced variables from different levels in three consecutive steps of model building. In the first step of each analysis, we estimated a null model (i.e., a model without predictors) to gauge the degree of shared variance in the outcomes.

Table 2 Descriptive statistics and scale reliabilities of study variables

	Beginning of the semester		Mid-semester		End of semester		ICC
	<i>M</i> (<i>SD</i>)	α	<i>M</i> (<i>SD</i>)	α	<i>M</i> (<i>SD</i>)	α	
<i>Students</i>							
Mental health	3.70 (0.84)	0.46	3.87 (0.96)	0.68	3.86 (0.96)	0.69	0.047
Physical health	3.69 (0.77)	0.76	3.65 (0.82)	0.78	3.71 (0.87)	0.81	0.033
Perceived teacher support	3.49 (0.81)	0.83	3.37 (0.84)	0.86	3.30 (0.90)	0.89	0.197
GPA	8.95 (0.84)						
<i>Teachers</i>							
Life satisfaction	5.25 (0.86)	0.77					
Teaching self-efficacy	7.21 (0.90)	0.92					

Note. $N_{\text{High school}} = 200$, $N_{\text{University}} = 210$, $N_{\text{Teachers}} = 66$

In the models predicting students' mental and physical health, in the second step we introduced L1 predictors: time and PTS. This step could clarify whether PTS is associated to student health outcomes, beyond the effect of time. In the third step, we introduced the cross-level direct effect of the teacher-level variables (L3) on the intercepts, testing the associations between teachers' SWB and student health. The last model, with PTS as outcome, was built similarly: we have modelled the effect of time at L1 in the second step, and the effects of teachers' SWB (L3) in the third step. The equations detailing the models can be consulted in the Supplementary Material that is associated with this manuscript.

Since teacher-level effects are the core focus of our models, all predictors were centered around the grand mean (Brincks et al., 2017), and time was centered around the first measurement moment. To determine effect sizes, we calculated pseudo- R^2 (Snijders & Bosker, 2012) to estimate incremental variance explained by adding parameters to previous models, and ICCs to determine variability accounted by teacher effects and inter-individual differences across students (Lorah, 2018). The improvement in model fit was tested by a chi-squared (χ^2) difference test using the log-likelihood.

4 Results

Means, standard deviations, and scale reliabilities across all three measurement points are summarized in Table 2, and bivariate Pearson correlations at L1 and L3 are summarized in Table 3.

Table 4 displays zero-order relationships between study outcomes and candidate predictors (i.e., multilevel covariance coefficients between our outcomes and each predictor). These results suggested that our three outcomes had different patterns of evolution throughout the semester: students' mental health seemed to improve ($B=0.079$, $SE=0.025$, $p<.01$), perceived teacher support seemed to decrease ($B=-0.096$, $SE=0.018$, $p<.01$), while students' physical health did not change significantly ($B=0.006$, $SE=0.020$, $p=.76$). GPA was not significantly associated with any of our outcomes, therefore we did not include it in our following analyses.

Table 3 Bivariate correlations among focal study variables at Level 1 and Level 3

	1.	2.	3.	4.	5.	6.	7.
1. Gender	-						
2. Student mental health	.01	-	.54*	.66*	.53	.64*	.50
3. Student physical health	.15**	.34***	-	.23***	.73**	.19	.77**
4. Perceived teacher support	-.06	.22***	.23***	-	.82***	.62*	.93***
5. Teacher life satisfaction					-	.49	.80**
6. Teaching self-efficacy						-	.48
7. Educational level							-

Note. Teacher-level (L3) correlations are displayed over the main diagonal. NL1 = 1230; NL3 = 14; Educational level was binary: High-school = 0, University = 1. Gender: Male = 0, Female = 1; *** $p < .001$, ** $p < .01$, * $p < .05$

Table 4 Zero-order relationships between study outcomes and candidate predictors

	Students' mental health	Students' physical health	Perceived teacher support
<i>Within-students predictors</i>			
Measurement moment	0.079** (0.025)	0.006 (0.020)	-0.096** (0.018)
Teacher support	0.191** (0.033)	0.153** (0.028)	-
<i>Between-students predictors</i>			
GPA (previous semester)	0.011 (0.046)	0.014 (0.034)	0.054 (0.045)
<i>Between-classes predictors</i>			
Teachers' life satisfaction	0.370 (0.216)	0.407** (0.081)	0.972** (0.147)
Teaching self-efficacy	0.673** (0.196)	0.103 (0.217)	1.013* (0.351)
Education level (0 = high school; 1 = university)	0.235 (0.130)	0.319** (0.069)	0.755** (0.105)

Regarding teacher-level variables, our preliminary analyses also indicated different patterns of associations: teachers' life satisfaction was significantly associated with students' physical health ($B=0.407$, $SE=0.081$, $p < .01$) and perceived teacher support ($B=0.972$, $SE=0.147$, $p < .01$), while teachers' self-efficacy was significantly associated with students' mental health ($B=0.673$, $SE=0.196$, $p < .01$) and perceived teacher support ($B=1.013$, $SE=0.351$, $p < .01$). Finally, we found that, university students reported higher levels of physical health ($B=0.319$, $SE=0.069$, $p < .01$) and perceived teacher support ($B=0.673$, $SE=0.196$, $p < .01$), as compared to high school students. Based on these results, we considered in the main analyses only the predictors that showed significant associations with student outcomes.

4.1 Relationships between teachers' SWB and students' subjective health

Results for the models with student's mental and physical health as outcomes are synthesized in Table 5. Regarding our first hypothesis, we found that students' subjective mental health was positively predicted by their teachers' self-efficacy ($\gamma_{001}=0.48$, $SE=0.17$, $p < .01$, in support for H1a). We did not find a significant zero-order relationship between students' subjective mental health

and their teachers' life satisfaction in the initial analyses ($B=0.37$, $SE=0.27$, $p=.17$), thereby we did not model this association further, considering H1b rejected. In addition to these results, in the main analyses we found that students' subjective mental health did not evolve significantly during the semester ($\gamma_{100}=0.10$, $SE=0.06$, $p=.94$).

Hypotheses regarding students' subjective physical health (i.e., H2a and H2b), were both rejected. We did not find a significant zero-order relationship between TSE and students' physical health ($B=0.10$, $SE=0.22$, $p=.65$, rejecting H2a), hence we did not model this predictor beyond the test for initial associations. While teachers' life satisfaction initially showed a significant zero-order relationship to students' physical health, when we modelled it alongside PTS (at L1) and educational level (at L3), it yielded a non-significant estimate ($\gamma_{001}=0.02$, $SE=0.14$, $p=.88$, rejecting H2b).

4.2 PTS as predictor of students' mental and physical health reports

The models presented in Table 5 also provided results regarding the within-student relationship between PTS and health outcomes. Perceived teacher support was a significant predictor of students' subjective mental health ($\gamma_{100}=0.20$, $SE=0.05$, $p<.01$), thus supporting H4a. Students' physical health was also positively associated with PTS across the semester ($\gamma_{100}=0.13$, $SE=0.04$, $p<.001$), in support of H4b.

4.3 Relationships between teachers' SWB and PTS

Finally, the results presented in Table 6 indicated that students' perceptions of teacher support were predicted only by educational level at L3 ($\gamma_{003}=0.34$, $SE=0.09$, $p<.01$). Despite the significant and positive zero-order associations found in the initial analysis, both TSE ($\gamma_{002}=0.30$, $SE=0.15$, $p=.14$) and teachers' life satisfaction ($\gamma_{001}=0.29$, $SE=0.18$, $p=.07$) yielded non-significant estimates, rejecting H3a and H3b in the main analysis. Finally, our analyses also indicated that students' perception of teacher support significantly decreased throughout the semester ($\gamma_{100}=-0.17$, $SE=0.04$, $p<.01$), and this decrease had significant variation across students ($r_1=0.05$, $p<.001$). Given the significant variation in this slope, we further tested whether teacher-level predictors can predict it. This analysis has yielded a significant cross-level interaction between educational level and the effect of time on PTS ($\gamma_{102}=0.16$, $SE=0.05$, $p=.005$), meaning that the decline is observable among high school students, and it has close-to-zero values in the case of university students.

5 Discussion

The present study investigated the relationships between teachers' SWB and students' subjective mental and physical health. We assessed teachers' SWB (i.e., life satisfaction and TSE) at the beginning of the second semester and we linked these measures to students' subjective health reports and PTS at three moments in time across the semester.

Table 5 Results of main analyses testing predictors of students' subjective physical and mental health at multiple levels

Level and variable	Random intercepts	L1 predictors	L3 predictors	Random intercepts	L1 predictors	Teacher effects (L3)
	<i>Physical health</i>			<i>Mental health</i>		
<i>Level 1</i>						
Intercept	3.65*** (0.05)	3.67*** (0.05)	3.58*** (0.03)	3.81*** (0.07)	3.72*** (0.05)	3.72*** (0.06)
PTS		0.15*** (0.04)	0.13** (0.04)		0.21*** (0.05)	0.20*** (0.04)
Measurement moment					0.10(0.06)	0.10(0.06)
<i>Level 3</i>						
Teacher life satisfaction			0.02(0.14)			-
Teaching self-efficacy			-			0.48*(0.17)
Educational level			0.21(0.09)*			-
<i>Variance components</i>						
Within-student (L1)	0.33	0.32	0.32	0.51	0.5	0.5
Between-student (L2)	0.34***	0.31***	0.31***	0.30***	0.28***	0.28***
Between-cluster (L3)	0.02***	0.01*	0.003	0.04***	0.03***	0.01**
<i>Model fit</i>						
-2LL (df)		53.4(1)***	13.7(2)***		93.9(2)***	10.2(1)***
Number of free parameters	4	5	7	4	6	7
Pseudo R2		0.07(7.3%)	0.01(1.4%)		0.05(4.7%)	0.02(2.4%)

Note. Robust standard errors of estimates are in parentheses; PTS=perceived teacher support;

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

5.1 Teachers' SWB and students subjective health outcomes

The results of this study highlighted TSE as an important teacher-level antecedent of students' subjective mental health. Students reported higher mental health across the semester, when they were taught by teachers who felt efficacious in teaching. This finding can theoretically be explained by the Prosocial Classroom model (Jennings & Greenberg, 2009), which postulated that teachers with higher well-being and social-emotional competence can influence student outcomes through the use of more effective teaching strategies. This aligns with previous empirical evidence that highlighted how teachers with higher TSE demonstrated better instructional quality and more efficient teaching at high standards, fostering engagement and achievement (Künsting et al., 2016; Zee & Koomen, 2016). Overall, the literature suggests that highly efficacious teachers create a learning environment in which students feel safe to explore, perceiving a better connection to the teacher and the overall school environment (Jennings & Greenberg, 2009). In this kind of learning environment, students have the space for a positive learning experience and are stimulated to achieve

Table 6 Results of main analyses testing predictors of PTS at multiple levels

Level and variable	Random intercepts	L1 predictors	L3 predictors
<i>Level 1</i>			
Intercept	3.65*** (0.05)	3.41*** (0.09)	3.30*** (0.07)
Time		-0.10**(0.03)	-0.18**(0.04)
<i>Level 3</i>			
Teacher life satisfaction			0.29(0.18)
Teaching self-efficacy			0.3(0.15)
Educational level			0.34(0.09)**
<i>Cross-level interactions</i>			
Time*Educational level			0.16**(0.05)
<i>Variance components</i>			
Within-student (L1)	0.29	0.28	0.22
Between-student (L2)	0.32***	0.32***	0.34***
Between-cluster (L3)	0.15***	0.15***	0.0005
<i>Model fit</i>			
-2LL (df)		52.9(1)***	142.5(9)***
Number of free parameters	4	5	14
Pseudo R2		0.01(1.3%)	0.25(25.2%)

Note. Robust standard errors of estimates are in parentheses; *** $p < .001$; ** $p < .01$; * $p < .05$

better, which helps them remain more emotionally healthy (Tilga et al., 2020; Ong et al., 2021). Previous studies have reported associations to healthier emotional experiences and less negative affectivity among teachers with higher TSE (Koenen et al., 2017; Prewett & Whitney, 2021). These findings suggested that there are multiple potential mediating mechanisms to explore in understanding the effects on student health measures, and looking into emotions that highly efficacious teachers experience and express, could shed some light into the relationship to students' subjective health.

Teacher life satisfaction showed a zero-order positive association to students' physical health but this relationship did not remain significant in the model where the effects of educational level and PTS were also present. Jennings and Greenberg (2009) argued that teachers play an important role model of social-emotional behaviour for students. This implies that, through the model of highly satisfied teachers, students could learn to be more satisfied with life themselves, which in turn has been found to associate with improved self-rated physical health among students (Zullig et al., 2005). Despite such arguments, our results replicated the non-significant link to student well-being discussed by Braun and colleagues (2020) in elementary schools. It seems that teachers' life satisfaction can be relevant in predicting prosocial behaviors in the classroom (Braun et al., 2020), and students' achievement (Duckworth et al., 2009), but was not directly connected to students' health, beyond the variability

that could be explained by the differences in educational levels. Nonetheless, this aspect of teacher SWB has received the least attention and empirical work so far and given the extensive evidence for the positive influence of life satisfaction and happiness in the occupational health literature (Erdogan et al., 2012; Lyubomirsky et al., 2005), we believe that further investigations with larger teacher samples might provide important findings related to this aspect.

5.2 Teachers SWB as predictor of PTS

In the framework of the Prosocial Classroom Model (Jennings & Greenberg, 2009) teachers' SWB in general is viewed as an important antecedent of PTS. However, our findings are inconclusive regarding this assertion. The initial correlations have suggested that teachers' life satisfaction and TSE are indeed associated with higher PTS, but these associations were not significant when educational level was also included as predictor alongside teacher SWB. This suggests that even if there is some degree of connection between teacher SWB and PTS, as suggested by previous research (Zee & Koomen, 2016), in our sample the difference in educational stages was a stronger predictor than teachers' life satisfaction or TSE.

Our results also indicated that university students rated significantly higher levels of PTS across the semester, as compared with high school students. A meta-analysis conducted by Lei et al., (2018) has compared the strength of the relationship between PTS and positive academic emotions across all stages from elementary school to university. Their results suggested that the strongest relationship across all stages can be found among university students, suggesting that they experience more positive emotional responses when their teachers are supportive, as compared to younger students. Hence, it is possible that university students appreciate more the time their professors allocate for supportive interactions. Hagenauer and Volet (2014), highlighted in their review that supportive interactions can be less frequent in higher education due to large numbers of students and heavy workloads that faculty members handle, but students often appreciate the quality of interactions over their frequency.

5.3 PTS as predictor of student subjective health outcomes

Our findings revealed PTS as an important predictor of physical and mental health across the semester. These results are in line with previous findings and highlight the value of PTS in fostering students' physical health not only in high school, as suggested by previous research (Dudovitz et al., 2016; Laftman et al., 2021), but also among older students in higher education settings. Moreover, our results are aligned with previous findings that linked PTS to lower internalizing problems (Conner et al., 2014), fewer depressive symptoms (Mizuta et al., 2016), and less anxiety and self-esteem issues (Wit et al., 2011). Theoretical explanations for these results can be found within Self-Determination theory (Ryan & Deci, 2001), which asserts that PTS can foster students' well-being through the satisfaction of basic psychological needs of relatedness and competence. From this perspective, when students feel that their teachers are considerate and supportive, they also feel more related and connected to their learning experience. Furthermore, when they perceive that they receive mean-

ingful instructional support, they can strengthen their sense of competence. Satisfying these psychological needs in turn, is a key determinant of students' adjustment and well-being (Ryan & Deci, 2001).

5.4 Implications for theory and practice

Our study has implications for our theoretical understanding of the well-being relationships between students and teachers in high-school and college settings. Because our participants were involved in secondary and tertiary education, our results extend the Prosocial Classroom model (Jennings & Greenberg, 2009), which were mostly supported by research conducted in primary education. Our findings bring support for the model to a degree but suggest that not all relationships function the same way when we consider the dynamics with older students. First, our results fully supported the models' assertion that PTS would be a key element in predicting student health and well-being. Supportive relationships with students seem to be highly beneficial, regardless the educational level students are currently pursuing. Second, while TSE (eudaimonia) had predicted better mental health among students, which aligned with the assertions of the Prosocial Classroom Model, teachers' life satisfaction did not predict any of students' health outcomes. This highlights that not all aspects of teachers' SWB have the same effects, and aspects of hedonic well-being and eudaimonia could have differential relationships to student outcomes. Third, while the model draws a direct relationship between teachers' SWB and PTS, our results were inconclusive in regards of this assertion. Both teacher SWB components have related to PTS in simple associations, but these became non-significant when the difference in educational level was accounted for. Consequently, we need much more future research in secondary and tertiary education settings, that would further probe the associations described in the Prosocial Classroom model and verify which of its assumptions, and to what degree are also valid outside primary education settings.

Our results also have practical implications for schools and teachers alike. First, teachers and professors need to be aware of the ways their self-efficacy in their teaching and quality of relationships with their students can influence students' subjective physical and mental health evaluations. The role model of teachers' socio-emotional behaviour and the supportiveness and caring they manifest in their interactions with students can have an impact on the development of their students' health (Suldo et al., 2009; Zee & Koomen, 2016), not only on their academic achievement.

5.5 Limitations and future research

One important limitation to have in mind while interpreting our results is the small sample size at the classroom level ($N=14$). While multilevel analysis can yield robust and reliable estimates with as few as 10 cluster (Snijders & Bosker 2012) the number of clusters available for us in this study did not provide sufficient power to estimate highly parametrized models. Thus, while results from earlier educational stages point towards a possible mediating mechanism between teachers' SWB and student outcomes through PTS (Jennings & Greenberg, 2009), our data only allowed us to construct separate models, investigating PTS as outcome of teachers' SWB in one model,

while testing it as predictor in others. Future research could advance our knowledge by focusing more on the role of PTS as mediator (Harding et al., 2019) between teachers' hedonic SWB and students' physical health, while at the same time testing better instructional quality (Jennings & Greenberg, 2009; Zee & Koomen, 2016), satisfaction of basic psychological needs (Ryan & Deci, 2001), and possibly self-regulations strategies (Braun et al., 2020) as mediators between teachers' eudaimonia and students' mental health. The reduced sample size at the teacher level might have also accounted for the non-significant results in the multi-level models, compared to the associations found in the correlations. Therefore, we advise to view the non-significant findings regarding the relations between teacher SWB and student health with caution, and to further explore these with a larger sample of classes.

Another limitation of this study concerns the directionality of the well-being dynamics in the classroom. As most of the research before, we focused on the effects of teachers' SWB on student outcomes. This preoccupation is understandable, given that students are the primary and most important beneficiaries of the educational activity at any grade level. However, it is most likely that the dynamic between students' health and teachers' SWB is bidirectional. Jennings and Greenberg (2009) emphasized this in the Prosocial Classroom Model, proposing so-called burnout cascades, whereby teachers struggling with low well-being have difficulties in establishing relationships with students and implementing efficient instructional strategies, leading to poor outcomes for students, which feed back into teachers' exhaustion and well-being issues. Furthermore, PTS also seems to work both ways, as teachers are experiencing lower TSE and less enjoyment in their profession when they struggle with conflictual and unsupportive relationships with students (Spilt et al., 2011). However, most of these associations are derived from correlational research predominantly conducted with young children (Jennings & Greenberg, 2009; Spilt et al., 2011; Zee & Koomen 2016). At this moment we need more evidence from intensive longitudinal studies (e.g., experience sampling studies) focusing on both parties' SWB and daily emotions (Spilt et al., 2011) to better understand and explain the relationships that we observe at all educational levels.

Finally, our sample was predominantly composed of female students, especially at the university level, which somewhat limits our generalizability to study-domains predominantly chosen by girls (e.g., educational sciences, social work, psychology). Future studies that account for gender differences in student health or perceived teacher support could uncover potential gender-specific effects and phenomena.

5.6 Conclusion

This study has highlighted the complex and multi-layered nature of the relationships between teachers' SWB and students' health. How confident the teacher is, and how s/he relates to life and its' challenges remain factors that could be relevant in further investigations aiming to uncover the inter-relations between teacher SWB and student health and well-being. Our study also points towards the importance of PTS in improving students' health. While previous research has established the importance of student-teacher relations for younger childrens' well-being, our research clearly showed that this remains true across higher educational stages, and high-school and

university students also feel healthier when their teachers make efforts to offer them support.

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Declarations

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval This study was conducted following the American Psychological Association’s ethical guidelines and the ethical review board of the West University of Timișoara. Based on these guidelines, studies using standardized self-report surveys in which participants are neither deceived nor involved in an intervention are formally exempted from an institutional ethics committee’s approval.

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