

Subjective well-being and school engagement before versus during the COVID-19 pandemic: What good are positive emotions?

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Abstract

The present study overcomes the limited empirical evidence on the association between well-being and school engagement in times of adversity by exploiting available data from two large and comparable samples of eighth graders; one obtained prior to the COVID-19 pandemic and the second obtained during the pandemic. Results suggest that adolescents were less engaged with their learning context during the pandemic, as well as lower in positive and negative affect, but slightly more satisfied with life. Through SEM we found a stronger positive association between positive affect and school engagement in the COVID-19 group compared with the pre-COVID-19 group. This finding highlights the important role of positive affect in supporting better academic functioning in the aftermath of a global crisis.

KEYWORDS

adolescents, COVID-19 pandemic, school engagement, subjective well-being

INTRODUCTION

The global COVID-19 pandemic has had a substantial and lasting impact on individual and societal functioning. Soon after the pandemic was declared in March 2020, many countries imposed strict public health policies to contain the virus. For many populations, this involved restrictions on travel, the mandatory wearing of face masks, social distancing, and spending considerable time at home, often in isolation, during periods of “lockdown.” Despite such measures, COVID-19 exacted a heavy toll on society and continues to be a threat to life. At the time, this article was written (January 2023), over 6.7 million deaths

due to COVID-19 have been registered worldwide (World Health Organization [WHO], 2020). Additionally, the economic effect of the COVID-19 pandemic has been considerable, with many adults experiencing threat of, or actual, loss of income and livelihood. In this way, the COVID-19 pandemic can be defined as a collective trauma in so far that it posed a genuine risk to peoples' lives and livelihoods (Muldoon, 2020).

The impact of the COVID-19 pandemic on youth and adolescents has been particularly profound, with many studies demonstrating that experience of the pandemic was linked to reductions in well-being and psychosocial functioning (Nearchou et al., 2020). For example, longitudinal studies

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spanning the onset of the pandemic have shown that subjective well-being declined (Steinmayr et al., 2022), and that internalizing problems increased (Fischer et al., 2022). Similar findings have been made by studies assessing well-being in the same sample before vs. after the onset of COVID-19 (Mastorci et al., 2021). A serendipitous natural experiment comparing two groups of adolescents also showed that depressive symptoms were higher and life satisfaction lower in the group exposed to COVID-19 (vs. controls who completed baseline and follow-up assessments before the pandemic) (Mansfield et al., 2022).

Beyond its impact on well-being, the COVID-19 pandemic has also shown to have a clear negative impact in the context of school and education (UNESCO, 2020), where many students experienced a sudden change from an in-person to remote educational context. Indeed, studies have revealed drops in adolescent academic performance (Panagouli et al., 2021), school satisfaction (Cingel et al., 2022), academic motivation (Klootwijk et al., 2021), academic well-being (Duckworth et al., 2021), and school engagement (McKellar & Wang, 2023; Salmela-Aro et al., 2021). Given an extensive literature on the impeding impact of negative emotions, anxiety, and stress on academic-related outcomes (Pascoe et al., 2020; Pekrun et al., 2017; von der Embse et al., 2018), one clear possibility is that these undesirable academic consequences are linked to the COVID-caused reductions in well-being.

Although the COVID-19 pandemic was shown to increase stress, anxiety, and negative emotions, research also suggests it was highly unlikely that adolescents did not also have some co-occurring positive subjective experiences (Diener & Emmons, 1984; Folkman, 1997; Fredrickson et al., 2003). Adolescents may have felt sadness at being physically separated from their friends, for example, but at the same time grateful for the comfort and safety of home learning (Curelaru et al., 2022). Critically, various theories of human development and adaptation posit that such positive subjective experiences despite stress and challenging circumstances, in fact, serve to promote coping and even flourishing (Fredrickson et al., 2003). Indeed, this is supported by myriad studies showing the central role of well-being, and positive emotions in particular, as a buffer against stress (van Steenbergen et al., 2021) and in promoting healthy human functioning (Diener & Chan, 2011; Fredrickson, 2001; Fredrickson & Joiner, 2002, 2018; Lyubomirsky et al., 2005), including in the context of school and education (Ouweneel et al., 2011; Pekrun, 2017; Reschly et al., 2008). However, there has been little research into the benefits of well-being for adolescents academic functioning during times of collective or individual trauma (as experienced during COVID-19, but also potentially in the future, for example, during war or economic crises). With the serendipitous availability of large and broadly representative samples of adolescents from before and during the COVID-19 pandemic, the present study was able to address this gap in knowledge. Specifically, using a multi-group structural equation modeling (MG-SEM) approach to analyze cross-sectional data, we sought to

test whether the beneficial role of well-being for adolescent school engagement differed as a function of exposure to the COVID-19 pandemic. Prior to this, it is useful to briefly define school engagement and subjective well-being, as well as to consider evidence of their associations:

School engagement

School engagement (sometimes also referred to as student engagement or academic engagement) is a prevalent construct in the fields of psychology and education for understanding positive child and adolescent development. In part, the popularity of the school engagement construct is owed to myriad studies demonstrating it is (a) a strong predictor of educational and developmental outcomes such as academic performance (Wang & Eccles, 2012a) and lower substance abuse (Froiland et al., 2021; Li & Lerner, 2011); and (b) a product of interactions between the student and their learning context (Moreira & Lee, 2020; Skinner et al., 2008; Wang, Degol, & Henry, 2019), implying it can be shaped and promoted through interventions (Wang & Holcombe, 2010).

Although there are numerous school engagement frameworks (Fredricks & Paris, 2004; Moreira et al., 2020; Wang, Degol, & Henry, 2019), a common feature among most is that they conceptualize engagement as a broad multidimensional construct with three major components: behavioral, emotional, and cognitive. In this way, school engagement can be thought of the quality of a student's subjective experience of, and interactions with, the learning context as expressed in their feelings (e.g., positive emotional experiences and sense of belonging; "I am happy to be at my school"), thoughts (e.g., positive appraisals and beliefs; "What I am learning in class is important for my future") and actions (e.g., effort, attention and intensity in the performance of learning activities; "I check my schoolwork for mistakes") (Moreira et al., 2020). Thus, aligning with concepts from the positive psychology movement (Seligman & Csikszentmihalyi, 2000), school engagement can be broadly considered an indicator of adaptive and positive functioning in the learning context (Reschly et al., 2008). Supportive of the idea that cognitive, emotional and behavioral engagement is conceptually related at the global construct level, several recent studies have supported a bifactor model in which school engagement can be characterized by a single global factor (Inman et al., 2020; Moreira et al., 2020; Wang, Fredricks, et al., 2019).

Subjective well-being

Myriad studies grounded in theories of child development and human adaptation highlight the essential role of subjective well-being in adolescent functioning (Fredrickson, 2001; Pekrun, 2017). Subjective well-being is a broad term that refers to a person's evaluations of, and emotional responses to their life circumstances, or more simply the degree to which they experience their life positively rather than negatively

(Diener, 1984; Diener et al., 2018). In this way, subjective well-being is typically described as comprising a cognitive domain (including all different forms of judging/appraising one's life as satisfactory; Diener et al., 2017) and an affective domain (which includes the balance of positive affect versus negative affect).

Because positive affect, negative affect, and life satisfaction consistently emerge as separate factors in factor analysis (e.g., Arthaud-day et al., 2005) and show distinct patterns of association with other variables (Diener et al., 2017; Moreira et al., 2023), they are often assessed individually. For this purpose, there are various self-report measures, including those designed for use with adolescent samples. A prominent and extensively validated measure of positive affect and negative affect aligning with a large body of research demonstrating the independence of positive and negative affect (Diener & Emmons, 1984; Larsen et al., 2001, 2017) is the Positive and Negative Affect Schedule (PANAS; Watson et al., 1988). Cognitive well-being, which encompasses different forms of appraising satisfaction with one's life in relation to personal goals, expectations etc., can be assessed with measures such as the Multidimensional Student Life Satisfaction Scale (Huebner et al., 2006).

The benefit of subjective well-being for school engagement

According to the broaden-and-build theory (Fredrickson, 2001, 2013), affective states produce coordinated changes in a person's thoughts and actions. Specifically, while negative affect is thought to narrow a person's momentary attentional and cognitive processing in a way that encourages specific behavioral patterns (e.g., flight or attack in response to fear), positive affect broadens attentional and cognitive processing in a way that facilitates flexibility in responding (e.g., exploration or play; Fredrickson & Branigan, 2005) and eventually helps with the accrual of enduring social, intellectual, psychological, and even physical resources (such as resilience; Fredrickson et al., 2003) that can buffer against stress and help facilitate more adaptive functioning during challenging circumstances or crises (Fredrickson et al., 2003). Therefore, it is expected that experiences of positive emotion during the pandemic can facilitate resilience, coping, and thriving in adolescents in a way that supports school engagement.

Consistent with this prediction, studies have confirmed that adolescents' emotional experiences have an influence on school engagement. For example, studies with longitudinal and experimental designs have shown that students reporting more positive emotions were more likely to report higher future emotional and behavioral engagement in school (King, 2015). In turn, other longitudinal studies have shown reciprocal relations between well-being (positive emotion and satisfaction) and engagement that foster upward spirals of increasing engagement (Salanova et al., 2011). Various cross-sectional studies have also identified positive

associations between positive emotions and student engagement, and negative associations between negative emotions and school engagement (Heffner & Antaramian, 2016; Moreira, Faria et al., 2020; Reschly et al., 2008).

Additionally, studies also suggest that adolescents' appraisals about their contentment with their life (life satisfaction) are linked to school engagement. Consistent with conceptualizations of subjective well-being as a causal system in which positive and negative affect inform one's cognitive appraisals (Kuppens et al., 2008), studies have suggested that life satisfaction may reflect a psychological resource (Suldo & Huebner, 2004) that results from the broadening effect of positive emotion. However, a study by Heffner and Antaramian (2016) demonstrated that life satisfaction had incremental validity over positive and negative affect in predicting school engagement, which suggests that all three components should be considered for understanding the role of subjective well-being on school engagement.

Current study

Research indicates that the COVID-19 pandemic had negative consequences for adolescents' academic performance (Panagouli et al., 2021), academic motivation (Klootwijk et al., 2021), and school engagement (McKellar & Wang, 2023; Salmela-Aro et al., 2021). Therefore, there is a need to study the psychological processes and resources that can protect against such negative outcomes in case of future crises or collective traumas (e.g., war or economic crises). With the availability of comparable samples of adolescents from before and during the COVID-19 pandemic, the present study aims to address this issue. Specifically, we considered the following research questions:

1. During the pandemic, did adolescents experience different levels of school engagement than they would have likely experienced in nonpandemic conditions?
2. During the pandemic, did adolescents experience different levels of positive affect, negative affect, or life satisfaction than they would have likely experienced in nonpandemic conditions?
3. During the pandemic, did subjective well-being have different relevance for school engagement that in nonpandemic conditions?

METHOD

Study design and recruitment

The present study considers two large and broadly representative samples of adolescents, attending schools in Portugal, from independent longitudinal studies. Both studies involved an assessment moment while adolescents were in the third term of eighth grade (in Portugal, the age of entry for eighth grade is 13 years). Participants from

Study 1 (pre-COVID-19 group) were in eighth grade for the 2013/2014 academic year, and so had no exposure to COVID-19. Participants from Study 2 (COVID-19 group) were in eighth grade for the 2019/2020 academic year and so experienced the COVID-19 pandemic during their second term of eighth grade.

Pre-COVID-19 group

Adolescents in the pre-COVID-19 group were participants in a longitudinal study on school engagement (September 2012–July 2018). To recruit participants for this longitudinal study, we used the national territorial distribution of schools as strata for school sampling. Specifically, we selected schools from the Northern, Central, and Lisbon regions of Portugal, which are the most populated regions and where most schools are located. From these regions, we contacted and recruited middle schools and mixed-grade schools that include grades seven to nine, as well as all secondary schools (which include grades 10 to 12).

To recruit students from participating schools, we requested that schools provide an average test score from standardized national examinations in Portuguese and Math for each class of students in the seventh and/or 10th grades prior to the initial assessment moment. We then recruited students from three classes, representing lower-than-average, average, and higher-than-average ability, from each target grade in all schools. All students from the selected classes were asked to participate in the study to allow for natural variance in student demographics. We returned to the same samples of schools and students for all waves of the broader study.

COVID-19 group

Adolescents in the COVID-19 group were participants in a longitudinal study on engagement with sustainable development (May 2019–June 2021). Participants for the COVID-19 group were recruited using a similar methodology to the pre-COVID-19 group. The research team contacted approximately 150 schools with grades seven to nine from across the most populous regions of Portugal. To allow for natural variance in student demographics, we invited all seventh grade students from participating schools to be involved in the study. We returned to the same samples of schools and students for all waves of the broader study.

Participants

The pre-COVID-19 sample was defined as all participants from the longitudinal study on school engagement that completed at least 75% of items from the study measures during the third term of eighth Grade (this excluded all

participants who initiated the longitudinal study in 10th grade). Similarly, the COVID-19 sample was defined as all participants from the longitudinal study on engagement with sustainable development that completed at least 75% of items from the study measures during the third term of eighth grade. After these exclusions, the final analytic sample comprised 3107 adolescents. The pre-COVID-19 group comprised 1437 adolescents from 66 schools (average of 22 students per school) whereas the COVID-19 group comprised 1670 adolescents from 52 schools (average of 32 students per school).

Variables and measures

School engagement

We assessed school engagement using items from the Multifactorial Measure of Student Engagement (MMSE; Moreira et al., 2020). Specifically, we considered the same subset of items that capture the emotional, cognitive, and behavioral domains of school engagement. A confirmatory factor analysis of these items supported a bifactor structure and the presence of a global school engagement latent factor (Moreira et al., 2020). The pre-COVID-19 group and COVID-19 group experienced different presentations of the MMSE, a main difference being that for the COVID-19 group items referring to emotions, cognitions, or behavior “in class” were changed to refer to “in home class” (see Appendix S1 for further details).

Subjective well-being

Positive and negative affect

We measured positive and negative, the affective component of subjective well-being, affect using the Positive and Negative Affect Schedule (PANAS; Watson et al., 1988). The Portuguese version of the PANAS (Galinha et al., 2013; Galinha & Pais-Ribeiro, 2005a; Galinha & Pais-Ribeiro, 2005b) comprises 20 adjectives describing positive and negative emotions and feelings (10 items each). The measure asked participants to indicate the extent to which they experienced each emotion in the last 2 weeks from 1 (*very slightly or not at all*) to 5 (*extremely*). An average score is calculated for positive affect and negative affect separately.

Life satisfaction

We used the Brief Multidimensional Students' Life Satisfaction Scale (BMSLSS; Huebner et al., 2006) to evaluate adolescents' satisfaction with life in specific domains and in general. The Portuguese version of this scale has been shown to have good psychometric properties in Portuguese adolescents, with the six items found to load on a single latent factor (Costa et al., 2022). All six items of the Portuguese version, presented in the form of “My satisfaction with ...

is..." are scored using a 7-point scale from 1 (*Terrible*) to 7 (*Fantastic*).

Statistical analysis

Missing data

As an initial step to treating data, we examined the rates of missing data for the main study variables. Overall, the amount of missing data was very small for all variables. Across the main study variables, most participants had no missing data (average = 97% of participants). Consequently, we used the *mice* package in R (Buuren & van Buuren & Groothuis-Oudshoorn, 2011) to impute missing values using a single predictive mean matching method.

Sample characteristics

First, we compared the characteristics of the schools for the two independent samples to understand whether there were any relevant differences. This was followed by a comparison of demographic characteristics of the adolescents in each of the samples for the same purpose.

Measurement invariance analysis

To examine the extent to which study measures were invariant across the two groups, and to confirm whether methodological differences between the studies did not result in adolescents interpreting the measures in a significantly different way, we performed multi-group confirmatory factor analyses (MG-CFA; Vandenberg & Lance, 2000). MG-CFA involves performing a series of confirmatory factor analyses to test models with an increasing number of imposed parameter constraints. For this purpose, we used the *lavaan* and *semTools* packages in R. Because PANAS items were scored using a Likert-type scale from 1 to 4, we followed procedures for testing measurement invariance with categorical outcomes (Svetina et al., 2020). This involved comparing the fit of a baseline configural model, a threshold equality model, and a threshold and loading equality model. To evaluate model fit and noninvariance, we referred to recommended thresholds of $\Delta\text{RMSEA} \leq 0.05$ in conjunction with sig. $\Delta\chi^2$ and $\Delta\text{CFI} \geq -0.004$ for metric invariance, and $\Delta\text{RMSEA} \leq 0.01$ in conjunction with sig. $\Delta\chi^2$ and $\Delta\text{CFI} \geq -0.004$ for scalar invariance (Svetina et al., 2020). For the BMSLSS and the MMSE, we followed procedures for testing measurement invariance with continuous outcomes. This involved comparing the fit of a baseline configural model, a loading equality model, and a loading and intercept equality model. To evaluate model fit and noninvariance, we referred to recommended thresholds of $\Delta\text{RMSEA} \leq 0.03$ and $\Delta\text{CFI} \geq -0.020$ for metric invariance, and $\Delta\text{RMSEA} \leq 0.01$

in conjunction with sig. $\Delta\chi^2$ and $\Delta\text{CFI} \geq -0.010$ for scalar invariance (Svetina et al., 2020).

Comparison of latent means: Differences in well-being and school engagement?

To address our study aim of comparing the pre-COVID-19 and COVID-19 groups, we used MG-CFA to estimate and test latent mean differences for each of the study measures. Estimating latent means from measurement models, as compared to observed means, has the benefit of accounting for measurement error and different factor loadings for the scale items. For these comparisons, the scalar invariance models for each variable were used as a baseline. To compare the pre-COVID-19 and COVID-19 groups, we constrained the pre-COVID-19 latent mean to 0 while allowing the latent mean of the COVID-19 group to be estimated freely. The significance of the latent mean difference was considered by dividing the parameter estimated by its standard error (critical ratio). A positive value >1.96 indicates the COVID-19 group had a significantly higher latent mean than the pre-COVID-19 group while a negative value < -1.96 indicates a significantly lower latent mean.

The well-being-school engagement association: Testing the structural model

Having focused on measurement models to confirm measurement invariance and test latent mean differences, we next sought to estimate the hypothesized structural model, in which subjective well-being dimensions predict variance in school engagement, for the full sample. In this structural model, latent factors for each variable were estimated by using a single composite indicator and fixing its error variance. Unstandardized error variances for each composite were then calculated using Cronbach's alpha coefficients and the variance of the composite score (see Yost & Finney, 2018). The latent factor for life satisfaction was allowed to freely correlate with the latent factors for positive affect and negative affect. Given prior evidence, we fixed the covariance between negative affect and positive to zero, which resulted in the model being under-identified. Positive affect, negative affect, and life satisfaction were all regressed on the latent factor for school engagement. An observed variable for gender (dummy coded with Female = 1) was also included and allowed to correlate freely with other latent factors to serve as a control variable. This model was estimated using cluster-robust cluster errors to account for grouping at the school level.

Multi-group SEM

To understand differences in the relation between subjective well-being based on exposure to COVID-19, we first estimated the same structural model in each group

separately and compared the significance and magnitude of path coefficients, as well as indices of model fit. Next, to obtain a deeper understanding of how the structural models differed across groups we performed a multi-group SEM analysis. First, we estimated a baseline structural model with no parameter constraints (M1) and compared this to a fully restricted model in which all regression paths were constrained to be equal across groups (M2). The significant $\Delta\chi^2$ value indicated that the groups differed in path coefficients. We next tested the restricted model against a series of less restrictive models in which one regression path was allowed to be freely estimated.

Ethical issues

Both studies were approved by the appropriate Ethics Committee of [anonymous]. Adolescents were only able to participate in the study if they gave their informed consent (indicated by a signature on a consent form) and obtained consent from a parent or legal guardian (also indicated by a signature on a consent form).

RESULTS

Sample characteristics

Table 1 presents descriptive statistics for the schools in the two study groups. There were more schools in the pre-COVID-19 group, although the distribution of schools according to school-level characteristics was similar. Notably, there were more private schools in the pre-COVID-19 group, and a larger proportion of schools from the Southern regions of Portugal. However, Fisher's exact test for Count Data indicated that there were no significant differences between the groups in terms of school type ($p = .107$) or school location ($p = .258$).

TABLE 1 Descriptive statistics (count, %) of school characteristics in the study samples.

	Pre-COVID-19 group	COVID-19 group
No. of schools	66	52
<i>School type</i>		
Basic education only	21 (31.8%)	22 (42.3%)
Basic and secondary education	38 (57.6%)	28 (53.8%)
Private	7 (10.6%)	1 (1.9%)
Vocational	0 (0.0%)	1 (1.9%)
<i>Region</i>		
North	42 (63.6%)	38 (73.1%)
Central	13 (19.7%)	11 (21.1%)
Lisbon	3 (4.5%)	0 (0.0%)
Alentejo	8 (12.1%)	3 (5.8%)

Table 2 presents descriptive statistics for individual-level characteristics for the two groups. The gender distribution was similar for the two groups, with slightly more girls than boys in both instances. However, a chi-squared test indicated that the difference in gender composition between the two groups was not statistically significant, $\chi^2(1) = 2.70$, $p = .100$.

Equivalence of study measures across groups

Table 3 summarizes the output of the MG-CFA analyses performed to test measurement invariance. High CFI values (all >0.90 and most >0.95) and low SRMR values (most <0.08) generally supported the baseline (or configural) models. RMSEA values were unsatisfactory for positive affect, negative affect, and life satisfaction, although these models were characterized by few degrees of freedom, which can lead to poor RMSEA despite good model fit (Kenny et al., 2015). Overall, changes to RMSEA, CFI, and SRMR with the addition of parameter constraints were sufficiently small to suggest that the measures were equivalent across groups at the scalar level (although only partially for positive affect and life satisfaction). Standardized factor loadings for the bifactor school engagement models are presented in Appendix S1.

Descriptive statistics

Means, standard deviations, and indicators of skewness and kurtosis for the study variables are presented in Table 4. Overall, adolescents' responses were skewed slightly toward elevated school engagement and subjective well-being, which is in keeping with the positivity offset hypothesis (i.e., that humans are biased toward positive subjective experiences; Cacioppo et al., 1997). However, the values of skew ($<|2|$) and kurtosis ($<|7|$) fell within acceptable limits to prove a normal univariate distribution.

Comparing adolescents from before and during the COVID-19 pandemic

Table 5 summarizes estimates of latent mean differences for the main study variables. For all variables, the estimated differences between groups were statistically significant. Consistent with our expectations, we found that the

TABLE 2 Descriptive statistics (count, %) of individual-level characteristics in the study samples.

	Pre-COVID-19 group	COVID-19 group
No. of students	1437	1670
<i>Gender</i>		
Male	654 (45.5%)	744 (44.6%)
Female	774 (53.9%)	780 (46.7%)

COVID-19 group had significantly lower school engagement and positive affect. However, we also found that the COVID-19 group had significantly lower negative affect and significantly higher life satisfaction.

The well-being school engagement association: Testing the structural model

The results of the SEM analysis are summarized in Figure 1. Fit indices showed the model had good fit to the data, CFI=0.992, RMSEA=0.042, SRMR=0.023, thus lending support to the hypothesized model. Full parameter estimates for this model are presented in Appendix S1.

Multi-group SEM

Figure 2 presents the structural models and standardized path coefficients for each group separately. The structural model fit well to the data for the COVID-19 group, CFI=0.999, RMSEA=0.024, SRMR=0.015, but poorly to the pre-COVID-19 group, CFI=0.605, RMSEA=0.327, SRMR=0.058. Thus, the proposed model appeared to be

much less adequate at accounting for the structural relationships between variables in the pre-COVID-19 group. Consistent with this, R^2 values for the latent school engagement factor were lower in the pre-COVID-19 group compared with the COVID-19 group.

To examine this noninvariance of regression paths more precisely, we performed a multi-group analysis, testing a series of models with different parameters restrictions (summarized in Table 6). These results indicated that the path from positive affect to school engagement was significantly higher in the COVID-19 group compared with the pre-COVID-19 group ($\Delta\chi^2(1)=39.50$, $p<.001$), while the path from life satisfaction to school engagement was significantly lower in the COVID-19 group compared with the pre-COVID-19 group ($\Delta\chi^2(1)=10.89$, $p<.001$). However, the path from negative affect to school engagement did not differ across groups ($\Delta\chi^2(1)=2.22$, $p=.136$).

DISCUSSION

The first aim of the present study was to provide evidence of the impact of the COVID-19 pandemic on adolescents' subjective well-being and experiences of school in Portugal

TABLE 3 Summary of measurement invariance analyses for study measures.

	$\Delta\chi^2$	p	RMSEA	CFI	SRMR	Δ RMSEA	Δ CFI	Δ SRMR
<i>Positive affect—unidimensional model</i>								
M1. Baseline ^a	—	—	0.070	0.991	0.046	—	—	—
M2. Threshold	554.70	<.001	0.085	0.982	0.046	0.015	−0.009	0.000
M3. Threshold + Loadings	312.92	<.001	0.106	0.968	0.059	0.021	−0.014	0.013
M4. Threshold + Loadings ^b	170.57	<.001	0.095	0.975	0.052	0.010	−0.007	−0.006
<i>Negative affect – unidimensional model</i>								
M1. Baseline ^c	—	—	0.122	0.978	0.083	—	—	—
M2. Threshold	129.73	<.001	0.111	.976	0.083	−0.011	−0.002	0.000
Threshold + Loadings	203.85	<.001	0.113	.972	0.084	0.002	−0.004	0.001
<i>Life satisfaction—unidimensional model</i>								
M1. Baseline	—	—	0.119	0.928	0.043	—	—	—
M2. Loadings	33.64	<.001	0.112	0.917	0.053	−0.007	−0.011	0.010
M3. Loadings + Intercepts	195.54	<.001	0.121	0.882	0.064	0.009	−0.036	0.011
M4. Loadings + Intercepts ^d	95.79	<.001	0.114	0.900	0.059	−0.007	−0.017	0.006
<i>School engagement—bifactor model</i>								
M1. Baseline	—	—	0.043	0.971	0.030	—	—	—
M2. Loadings	93.25	<.001	0.045	0.962	0.040	0.002	−0.009	0.010
M3. Loadings + Intercepts	113.32	<.001	0.049	0.951	0.045	0.004	−0.011	0.005

^aConfigural model achieved after excluding two items with low standardized factor loadings (<0.30).

^bPartial invariance model releasing constraint on loading for one item (PANAS_1).

^cConfigural model achieved after excluding one item with low standardized factor loading (<0.30).

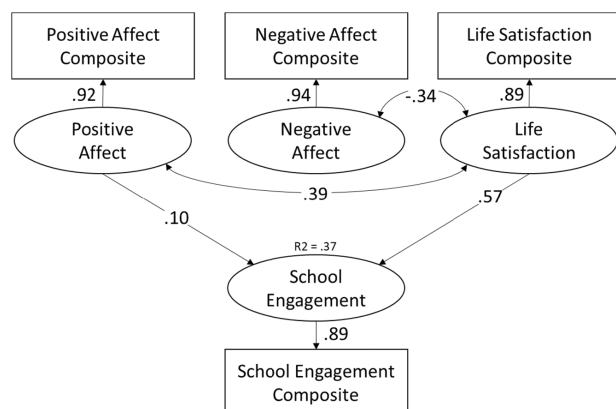
^dPartial invariance model releasing constraint on intercept for one item (BMSLSS_6).

TABLE 4 Descriptive statistics for study variables in the full sample, and Cronbach alpha values for each sample independently.

	<i>M</i>	<i>SD</i>	<i>Min</i>	<i>Max</i>	<i>Skew</i>	<i>Kurtosis</i>	Cronbach's α	
							Pre-COVID-19	COVID-19
School engagement	3.19	0.37	1.0	4.0	−0.35	0.87	0.79	0.85
Positive affect	2.91	0.71	1.0	5.0	0.26	0.09	0.83	0.82
Negative affect	1.74	0.69	1.0	5.0	1.02	0.53	0.86	0.88
Life satisfaction	5.99	0.74	2.17	7.0	−1.13	1.63	0.79	0.82

TABLE 5 Estimates of group latent mean differences for the study variables.

	Pre-COVID-19 group		COVID-19 group		Difference	
	Estimate		Estimate	SE	95% CI	<i>Z</i>
School engagement	0.00		−0.87	0.25	[−1.36, −0.38]	−3.46
Positive affect	0.00		−0.35	0.03	[−0.41, −0.28]	−10.44
Negative affect	0.00		−0.19	0.04	[−0.27, −0.11]	−4.47
Life satisfaction	0.00		0.13	0.04	[0.05, 0.22]	3.00

**FIGURE 1** Simplified structural model with standardized path coefficients of the hypothesized model for the full sample. All paths presents are statistically significant at $p < .05$.

(Research Questions 1 and 2). To achieve this, the study assessed differences in latent positive affect, negative affect, life satisfaction, and school engagement between two large comparable samples of eighth graders. The first group responded to the study measures in 2020 during a lockdown period of the COVID-19 pandemic. The second group responded to the same study measures in 2014, several years prior to the COVID-19 pandemic, and therefore acted as controls. Thus, by comparing the two groups the study provides some valuable insights into the impact of the pandemic.

Based on evidence acquired during the pandemic (Klootwijk et al., 2021; McKellar & Wang, 2023; Salmela-Aro et al., 2021), we had anticipated that students in the COVID-19 group would have suffered in terms of school engagement. Consistent with this prediction, we found that the estimate of school engagement was *lower* in the COVID-19 group relative to the pre-COVID-19 group. The fact that this

analysis was performed using a SEM approach (allowing estimates to account for measurement error), using a bifactor model of school engagement and robust cluster standard errors to account for the nesting of adolescents in different schools, and after confirming scalar invariance between the two comparable and broadly representative groups of adolescents is a strength relative to other similar studies and allows for a high level of confidence in this result. Taken at face value, then, this finding suggests that adolescents were less engaged with their learning context during the COVID-19 pandemic than would be expected if the COVID-19 pandemic had not occurred. Because school engagement has been demonstrated to be a strong predictor of better academic achievement (Lei et al., 2018), this result implies that observed decreases in academic performance in the pandemic (Panagouli et al., 2021) may be related to decreases in school engagement, although more research is necessary to ascertain these causal association.

School engagement is known to be dependent on students' relationships with teachers and peers because healthy relationships enable students to feel a sense of identification and connectedness with the learning environment (Skinner et al., 2009). Theoretically, this can be explained by the fact that healthy relationships satisfy adolescents' psychological need for a sense of relatedness with other people (Furrer & Skinner, 2003). In the context of the pandemic, when adolescents' social interactions with peers and teachers were limited to online lessons, one possibility is that students felt frustrated in their need for relatedness with others in the learning context, thereby negatively impacting on school engagement. Indeed, social interactions with peers are widely accepted to be a central component of healthy adolescent development and identity construction (Erikson, 1968).

Another finding from our comparison of latent means was that positive affect was significantly lower in the COVID-19 group relative to the pre-COVID-19 group. Thus, the study

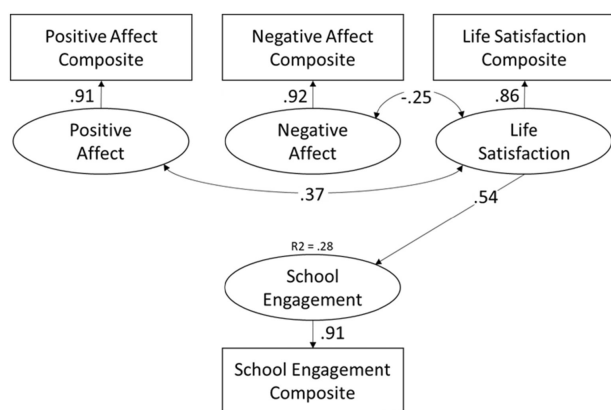
suggests that adolescents experienced less positive emotion during the COVID-19 pandemic than they would have likely experienced under nonpandemic conditions, a finding that aligns well with a growing body of research demonstrating the negative impact of the COVID-19 pandemic on well-being and mental health (Nearchou et al., 2020; Panchal et al., 2021). However, we also found that the COVID-19 group reported lower negative affect and higher life satisfaction relative to the pre-COVID-19 group. This observed

decrease in negative affect may at first seem at odds with research showing elevations in reported anger and irritability during the pandemic (Panchal et al., 2021). However, it is known from research that reductions in positive affect do not necessarily imply elevations in negative affect, as the two distinct subjective experiences are not opposing ends of the same dimension (Diener & Emmons, 1984; Larsen et al., 2001). Indeed, emotional blunting—the reduced ability to feel positive or negative emotions—is a common symptom of depression and anxiety disorders (Christensen et al., 2022). Thus, the observed decrease in negative affect aligns with research showing elevations in depression and anxiety following the start of the pandemic (Liu et al., 2022).

Although adolescents appeared to have suffered in terms of affective well-being relative to what they might have felt in nonpandemic conditions, they also reported increased levels of life satisfaction (although the difference was smaller in magnitude compared with the other study variables). This contrasts with findings from studies showing that life satisfaction declined in adults due to the COVID-19 pandemic (Zacher & Rudolph, 2021). While in adults the most important determinants of life satisfaction are health, family, and finances (van Praag et al., 2003), all of which were put at risk by the pandemic, this is not the case for adolescents, for whom life satisfaction is determined by a wider range of determinants (Proctor et al., 2009). However, this finding is more consistent with studies finding that most adolescents found their lives to be as satisfying (Choi et al., 2021) or more satisfying (Tang et al., 2020) since the pandemic, which aligns with current understanding that life satisfaction is a relatively stable phenomenon that is more strongly shaped by the accumulation of significant experiences over time (Anusic et al., 2014; Headey & Muffels, 2018).

Beyond examining differences in latent means, a second aim of the present study was to examine whether the beneficial role of well-being for school engagement differed as a function of exposure to the COVID-19 pandemic. Major results from our analyses were: (a) that well-being dimensions accounted for more variance in school engagement in the COVID-19 group than the pre-COVID-19 ground; and (b) that positive affect was more strongly associated with school engagement in the COVID-19 group compared with the Pre-COVID-19 group. Various past studies have demonstrated that positive and negative emotions are associated with school engagement

(a) Pre-COVID19 Group



(b) COVID19 Group

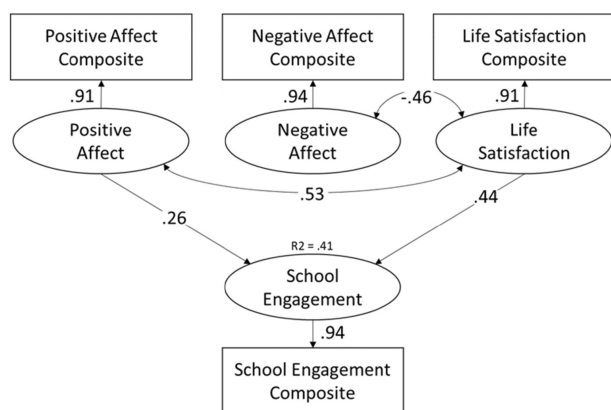


FIGURE 2 Simplified structural model with standardized path coefficients of the hypothesized model for A. the pre-COVID-19 group and B. the COVID-19 group. All paths presents are statistically significant at $p < .05$.

TABLE 6 Summary of multi-group analysis testing differences in path coefficients between the pre-COVID-19 group and COVID-19 group.

Model	χ^2	df	Comp.	$\Delta\chi^2$	p
M1: Baseline model	86.82	2	—		
M2: Fully restricted model	139.21	5	M1	34.56	<.001
M3: Positive affect → School engagement unconstrained	93.40	4	M2	39.50	<.001
M4: Negative affect → School engagement unconstrained	136.21	4	M2	2.22	.136
M5: Life satisfaction → School engagement unconstrained	127.49	4	M2	10.89	<.001

(Reschly et al., 2008), and that the mechanisms involved in these associations are diverse (Lyubomirsky et al., 2005). However, by demonstrating that the association between positive affect and school engagement was stronger in the COVID-19 group than the Pre-COVID-19 group our study makes an important contribution to the literature by indicating positive affect may be a buffer against the harmful effects of stress and adversity, minimizing negative consequences for academic functioning. Specifically, in times of adversity, positive emotions play a crucial protective role in modulating adaptive spirals involving cognitive-affective appraisals, sense of agency, and goal-motivated behavior (Cloninger, 2004; Svrakic et al., 1996). School engagement, as a subjective experience that emerges from the cognitive-affective appraisals that students make about their learning context, is, therefore, informed by the dynamics emergent from the lower levels of information processing, including the perception of the stimuli, their correspondent emotional reactions, and their respective conceptual meaning that will inform the current appraisals (Moreira et al., 2019, 2021). In the context of the COVID-19 pandemic, information processing included more threatening stimuli, eliciting negative emotions, physical restrictions limited opportunities to experience positive emotions, and this will have shaped affective-cognitive organizations, including motivation, that underlie the subjective experience of connection and identification with school (i.e., school engagement).

Overall, these findings suggest that efforts to promote subjective well-being, and particularly through the cultivation of positive emotions, can be beneficial for maintaining adolescent school engagement and associated academic outcomes during times of stress and adversity. In short, the results imply that in times of crisis, teachers and educators may be able to protect against negative academic outcomes by cultivating subjective well-being, and particularly positive emotions, in their students. As suggested by Fredrickson et al. (2003), one approach to this could be to help adolescents find positive meaning in daily life through a process of reframing (Folkman, 1997) or by using relaxation techniques (Fredrickson, 2000).

Strengths and limitations

The availability of two large datasets, one from pre-COVID-19 and the other during COVID-19, with common measures of subjective well-being and school engagement provided a serendipitous natural experiment for understanding the effect of a collective trauma on adolescent functioning. The confidence with which the observed differences between the two groups can be attributed to the COVID-19 pandemic, not other features of the samples, was increased by the fact that the samples were large and sourced from many schools across Portugal, suggesting that both were broadly representative of eighth graders in Portugal. Moreover, we found that both samples were relatively balanced on several school- and individual-level characteristics. However, owing to the cross-sectional post-test only quasi-experimental design, it is necessary to

acknowledge that the study does not benefit from the high internal validity of longitudinal experimental studies. Indeed, without pre-test (or pre-COVID-19) data for both samples this study was unable to control for any temporal changes in well-being or engagement. Consequently, we caution readers against inferring that the onset of COVID-19 was the cause of group differences in school engagement and positive affect. Moreover, we acknowledge that our hypothesized models did not control for various variables known to influence school engagement, such as the important role of social support for learning (Wang & Eccles, 2012b), that may have also been altered by the pandemic. We advise that future studies build on our results by incorporating these variables into their models.

To improve the robustness of our findings, we performed a series of measurement invariance analyses using multi-group CFA. These analyses offered evidence that the measures were equivalent, implying that differences in methodology (e.g., online vs. paper questionnaires) and context (i.e., no COVID-19 vs. COVID-19), did not significantly alter the way in which participants understood the measures. That said, we note that it was necessary to remove several items across the scales, and largely from the measure of affect, to achieve this equivalence, which suggests sample differences may have influenced the interpretation of some items. Moreover, for two scales scalar invariance was achieved only after freeing specific parameter constraints (partial scalar invariance). Given that other studies have also confronted issues of measurement noninvariance (Mansfield et al., 2022), we suggest there is a need for further research on how measures of psychological constructs might be interpreted differently due to the pandemic.

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SUPPORTING INFORMATION

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