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Subjective Well-Being and Bullying Victimisation: A Cross-National Study of Adolescents in 64 Countries and Economies

Ioannis Katsantonis[1] · **Beatriz Barrado**[2] · **Ros McLellan**[1] · **Gregorio Gimenez**[3]

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Abstract
Bullying is a recognised serious public problem affecting many students worldwide. Despite the well-established empirical evidence for the negative consequences of bullying on adolescents' mental and physical health and educational outcomes, little is known about the link between bullying victimisation and adolescents' subjective well-being. Moreover, empirical studies using comparative large-scale survey data are particularly scarce. This study explores this question using nationally-representative data from 329,015 adolescents across 64 high and middle-income countries and economies from the 2018 PISA survey. Two measures of subjective well-being were considered: overall life satisfaction and positive affect. Multilevel regressions were estimated at three levels (student, school, and country). Results showed that bullying victimisation was negatively and significantly related to overall life satisfaction and positive affect after controlling for a wide set of factors affecting subjective well-being. Moreover, this negative relationship was more pronounced for top performing students. Locally adapted intervention programmes are needed to tackle the issue of school bullying and foster positive school climate and student well-being. Practical and policy implications are discussed in detail.

Keywords Subjective well-being · Life Satisfaction · Positive Affect · School Bullying · Cross-national Comparison · PISA

The theoretical accounts of subjective well-being (SWB) define this construct as a subjective evaluation of overall and specific satisfaction with life and positive affect and the absence of negative affect (Diener, 2009; McLellan & Steward, 2015). It is important to study students' well-being since it is linked with better academic competence (O'Toole & Simovska, 2022), positive school functioning (Bird & Markle, 2012), and later-life health and socio-economic advantage (DeNeve & Copper,

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2012). Thus, rightly it has been described as an educational goal in itself (O'Toole & Simovska, 2022).

However, there is a globally growing concern about the declines in adolescent students' life satisfaction (Marquez & Long, 2020), and, especially, in developed countries (Due et al., 2019; Rees, 2019). This particularly concerning trend may manifest due to multiple factors, such as increasing levels of mental illness (Marquez et al., 2022), academic demands (Clarke, 2020), family background, and socio-economic status (SES) (Conger et al., 2010), school and classroom climate (Rathmann et al., 2018).

Nevertheless, one of the most pervasive educational problems across the globe, which can dramatically reduce SWB, is bullying victimisation at school. Bullying victimisation is usually defined as an aggressive physical and/or verbal behaviour that is repeated and is the product of a power imbalance between an agent (i.e., a bully) and the student who is the recipient of the aggressive action (i.e., victim) (Gimenez et al., 2021; Katsantonis, 2022; Olweus & Breivik, 2014). Recent evidence from 79 countries indicated that 23% of the secondary school students had fallen victim to school bullying victimisation at least a few times per month (OECD, 2019b) and school bullying victimisation is manifesting with different strength in different countries (Katsantonis, 2021).

Even though extant empirical evidence has examined the impact of school bullying victimisation on students' well-being (e.g., Arslan et al., 2021; Sharpe et al., 2021), these studies did not account for multiple resilience factors across different levels that can promote well-being. Additionally, preceding research works have focused on limited within-country data and, thus, could not adjust for potentially meaningful country-level covariates. Moreover, past studies did not explicitly control for potential school-level factors.

Overall, given the detrimental effect of school bullying on students' SWB, our study aims to explore this association using a large nationally representative sample from 64 countries. In this study, we adopt a multisystem resilience approach (Masten et al., 2021). In multisystem resilience theory, promotive factors occur at multiple systems that are interconnected (Masten et al., 2021). Based on the theory, the resilience capacity of a student to maintain sufficient levels of life satisfaction and positive affectivity depends not only on the individual's adaptive functioning and characteristics but also on the school system (Masten & Motti-Stefanidi, 2020) and more distal macrosystems (Masten & Motti-Stefanidi, 2020; Ungar, 2011). In this study, we account for both more proximal (e.g., school climate) and distal macrosystemic (e.g., countries' wealth) factors in the prediction of SWB. Specifically, the modelling accounts for personal factors (e.g., gender, age, immigration background, socio-economic status, and academic performance), school-level factors, such as the school climate (e.g., disciplinary climate, student co-operation, teacher support, teacher feedback), and country-level macrosystemic factors (e.g., human capital index, GDP per capita) that have been identified either as risk or protective factors. These variables are assumed to serve as promotive factors that sustain students' life satisfaction and positive affectivity, by being 'assets' that students from different cultural contexts hold and can improve their outcomes despite students

being potential subjects of adversity, manifesting as school bullying victimisation (Masten et al., 2021; Ungar, 2011).

1 Literature Review

1.1 Background characteristics' influence on subjective well-being

Multiple background characteristics have been linked with students' well-being. Most of the reviewed studies (e.g., Borraccino et al., 2018; Chen et al., 2020; Katsantonis et al., 2022), though, have not concomitantly explored how these background characteristics are influencing students' well-being across countries. These approaches do not offer a holistic picture of how these factors predict adolescent students' well-being when considered simultaneously.

The background characteristics considered here include gender, age, immigration background, and SES. Identifying as female has been connected to lower SWB (Chen et al., 2020; Katsantonis et al., 2022). Several studies have shown that, as students become older, their well-being declines (Brooks et al., 2020; Katsantonis et al., 2022). Higher individual socio-economic status has been found to be predictive of greater well-being (Shackleton et al., 2018). Similarly, coming from an immigrant background has been associated with lower SWB (Borraccino et al., 2018; Tang, 2019).

1.2 School climate and subjective well-being

Beyond students' background characteristics, other factors in the school ecosystem can play a protective role against declines in SWB. One such factor is school climate, which is defined as common beliefs, attitudes, and values that drive the interactions between students and adults and set the expectations of acceptable behaviours and norms in schools (Wang & Degol, 2016). Understandably, school climate is essential for fostering positive relationships and preventing problematic behaviours in school contexts (Thapa et al., 2013).

An integral aspect of the school climate is peer relationships (Katsantonis, 2024; Wang & Degol, 2016). Peer relationships play a critical role in both adaptive and maladaptive psychological functioning (Wentzel, 2017). Not all peer relationships are positive, though. As has already been noted, bullying victimisation, an aspect of peer relations, is consistently linked with lower SWB (Bradshaw et al., 2017). There are multiple pathways through which bullying may impact adolescents' SWB. For example, bullying victimisation can induce long-lasting physical harm and psychological distress (Vanderbilt & Augustyn, 2010; Wolke & Lereya, 2015), poor social school adjustment, and psychosomatic symptoms (Rigby, 2003; Wolke & Lereya, 2015), and a cycle of violence (Falla et al., 2022; Walters, 2021).

A supportive school climate is critical for fostering well-being (Mischel & Kitsantas, 2020; Wang et al., 2013) and reducing the risk of bullying victimisation (Coyle et al., 2017; Katsantonis et al., 2021). Teachers and peers are the main sources of social support in schools (Mischel & Kitsantas, 2020) and studies have shown that supportive

teachers are a significant protective factor against low levels of well-being (Flaspohler et al., 2009).

While a supportive school climate is important, it may not be enough on its own to promote well-being, according to authoritative school discipline theory (Gregory et al., 2010). A set of disciplinary norms and rules are also necessary to protect students' well-being by acting as a gatekeeper against problematic behaviours (OECD, 2019b). Empirical evidence underscores the importance of having a good disciplinary climate for promoting well-being (Kim et al., 2021). Hence, it is reasonable to include measures of both disciplinary climate and supportive peer and teacher relations (e.g., feedback, support, co-operation) in the model.

However, existing empirical models linking school climate indicators with students' students' victimisation experiences and well-being may be lacking to some extent since they do not account for the complexity of school climate. To this end, we seek to explore the potential associations between different aspects of school climate and students' well-being.

1.3 Country-level factors predicting subjective well-being

Despite the wealth of information on the antecedents of student well-being coming from preceding empirical studies, few studies have examined the potential impact of countries' structural characteristics on well-being. These macro-level indicators reflect countries' economic growth, educational attainment, and health outcomes (House et al., 2004; Kraay, 2019) and can influence people's health outcomes (Ran et al., 2023). Therefore, it is important to account for such influences on student well-being.

One of the most frequently cited country-level factors associated with well-being is economic growth (Mikucka et al., 2017). Economic success is typically measured through the gross domestic product per capita (GDP), which reflects the market value of the goods within a country within a specific period and is considered an indicator of the overall standard of living in a country (Wilson et al., 2013). However, in recent years, development scholars have advocated incorporating a holistic view in the measurement of a country's material well-being. Following this, the human capital index (HCI) is a composite indicator that reflects new-borns' survival rates, years of schooling, and health (Kraay, 2019). Nevertheless, the evidence regarding whether its impact is inconclusive. Some cross-national studies have found a negative relationship between economic growth and well-being (Rudolf & Bethmann, 2023), while other studies with adult samples indicate a positive relationship but moderated by other country-level factors (Mikucka et al., 2017). Additionally, other evidence with school-aged children did not find a significant association between the economic development and students' SWB (Lee & Yoo, 2015). Therefore, to be as inclusive as possible of the potential individual-, school-, and country-level antecedents of SWB, we included both GDP per capita and the HCI at the country-level.

1.4 The moderating role of academic performance

Studies analysing the links between academic performance and SWB have found mixed results. Some studies indicate an inverse link, with higher academic performance being associated with lower well-being (Bortes et al., 2021; Heller-Sahlgren, 2018), whereas other studies report a positive link (Bücker et al., 2018; Suldo et al., 2008). Moreover, some evidence suggests that those students with higher academic performance are subject to less bullying victimisation, although conversely there is some evidence indicating that poor academic performance is associated with bullying victimisation (Laith & Vaillancourt, 2022). A recent empirical study showed that students at the low and high ends of the achievement continuum were at significant risk to be subject of bullying victimisation (Park et al., 2017).

A systematic review of empirical evidence indicated that students' academic competence is indicative of their academic reputation and the latter has an impact on students' peer relationships (Laith & Vaillancourt, 2022). Research has shown that low-performing students had less chances of being accepted by their peers (Hughes & Zhang, 2007), whilst high-performing students were more accepted by peers (Green et al., 1980) and have more friends (Wentzel et al., 2018). Given that high-performing and low-performing students may be at higher risk for falling victims of bullies, it might be possible that students' achievement status may be interacting with bullying victimisation in the prediction of subjective well-being. Hence, we explore this relationship in the present study.

2 The present study

Informed by the reviewed evidence, we identified several evidence gaps in the extant literature. Specifically, preceding studies have not thoroughly explored how individual-level, school-level, and country-level indicators are collectively functioning as a comprehensive system to predict student SWB. Furthermore, limited research has examined how student bullying victimisation may function at different levels of academic performance and how this may lead to greater or lower SWB. Hence, the following research questions guide our present study:

RQ1: How is bullying victimisation associated with students' SWB after controlling for background characteristics, school climate perceptions, and country-level socio-economic indicators?
RQ2: Does academic performance moderate the association between bullying victimisation and SWB?

3 Method

3.1 Data and participants

The data came from the 2018 round of the Programme for International Student Assessment (PISA), a large international sample in three nested levels comprising 612,004 students attending 21,903 schools in 80 countries. The two-stage stratified random sampling process adopted in PISA ensured the representation of the entire target population at the country level (OECD, 2020). Our final sample consisted of students for whom data across all analysed variables were available. Notably, students from Spain and Vietnam were excluded due to concerns over the full assurance of international comparability (OECD, 2019a). This exclusion reduced the original sample to 570,684 students attending 20,663 schools in 78 countries and economies. Like other large-scale assessments, PISA is not immune to some technical problems. For example, the presence of missing observations stems from the fact that students and directors leave questions unanswered, given the lack of motivation when answering an evaluation that does not affect the students' academic record. Table 1 shows the share of missing values for all the variables included in the models. At the student level, missing data ranged from 0 to 24.26% (Bullying Victimization). At the school level, the range was from 5.61% (Disciplinary Climate) to 24.9% (Student Co-operation). At the country level, two countries (Belarus and Brunei Darussalam) lacked values for the Human Capital Index 2018, which diminished the initial sample to 76 countries.

Students with one or more missing values for any variable in our models were excluded using listwise deletion, ensuring that only complete cases were utilised for statistical analysis (see Table A1 in the Supplemental Materials). As Sun et al. (2012) and Fernández-Gutiérrez et al. (2020) point out, in the case of working with such a large data sample as the one compiled by PISA, the results do not vary significantly by making the estimates with the original sample or by imputing the missing values.

The current analytic sample sizes for the overall life satisfaction and positive affect models were 329,015 and 325,539 distributed across 64 countries. This accounted for 57.65% and 57.04% of the original PISA sample, respectively. Table A2 in the Supplemental Materials provides the countries and their corresponding sample size. These are referred to as countries, regardless of the status of Hong Kong, Moscow, and Tatarstan and the fact that in China, data refers to the regions and cities of Beijing, Shanghai, Jiangsu, and Guangdong.

3.2 Measures

In this section, we describe the variables included in the model. All indices were weighted likelihood standardized scores (Warm, 1989) that have a mean value of around 0 and a standard deviation of 1. Cronbach's alpha was used to check the internal consistency of each index within countries for cross-country comparisons. In all cases, Cronbach's alpha coefficients ranged between 0.7 and 0.9, indicating high internal consistency (OECD, 2020).

Table 1 Descriptive Statistics

	Mean/Frequency	SD	Min	Max	N	Missing	Share of missing values (%)
Dependent variables							
Overall life satisfaction	7.094	2.641	0	10	453,505	117,179	20.53
Positive affect	0.097	1.004	-3.067	1.239	453,953	116,731	20.45
Key independent variable							
Bullying victimisation	0.184	1.109	-0.782	3.859	570,684	138,452	24.26
Control variables							
Student-level							
Gender					570,682	2	0.00
Female	50.007						
Male	49.993						
Age	15.809	0.293	15.080	16.330	570,684	0	0.00
Country of birth					552,931	17,753	3.11
Country of the test	96.264						
Other country	3.736						
Economic Social and Cultural Status	-0.640	1.254	-8.173	4.205	556,959	13,725	2.41
Top performer					570,684	0	0.00
Yes	8.804						
No	91.196						
School-level							
Disciplinary climate	0.129	1.070	-2.712	2.035	538,683	32,001	5.61
Student co-operation	0.022	1.010	-2.143	1.676	433,197	137,487	24.09
Teacher support	0.243	0.946	-2.743	1.341	510,997	59,687	10.46
Teacher feedback	0.153	1.004	-1.639	2.017	507,398	63,286	11.09
Country-level							
Human Capital Index	0.690	0.095	0.490	0.880	558,053	12,631	2.21
GDP per capita	37.478	23.304	8.072	128.437	570,684	0	0.00

Note: Descriptive statistics were calculated using students' sampling weights. A total of 612,004 students completed PISA in 2018. However, students from Spain and Vietnam were excluded due to concerns about international comparability (OECD, 2019a; Annex A). This reduced the original sample to 570,684 students. The share of missing data is calculated based on this sample size

3.3 Dependent Variables

Overall life satisfaction was measured by the question "How satisfied do you feel about your life, on a scale from 0 to 10. Zero means you feel 'not at all satisfied' and 10 means 'completely satisfied". Higher values in the response indicated higher life satisfaction. Although single-items are often criticized, several empirical studies have confirmed their advantages over multi-item scales due to its simplicity in pro-

viding a subjective evaluation of adolescent life satisfaction in cross-cultural comparisons (OECD, 2013).

Positive affect was measured by the index constructed by PISA, which was derived from student responses about how frequently ("never", "rarely", "sometimes", "always") they feel happy, joyful, and cheerful. The index average was 0 and the standard deviation (SD) was 1 across OECD countries. Positive values in this index indicated that the student reported higher positive affect than the average student across OECD countries.

3.4 Independent Variables

Bullying victimisation was measured by the index of *bullying victimisation*. This index is based on students' experiences with bullying-related behaviours at school. It measures three types of bullying: physical, relational, and verbal. The index was derived from student responses about how frequently (ranging from "never or almost never" to "once a week or more") during the 12 months prior to the PISA test they have had the following experiences in school: (1) "Other students left me out of things on purpose" (relational bullying); (2) "Other students made fun of me" (verbal bullying); (3) "I was threatened by other students" (verbal/physical bullying). The index average was 0 and the SD was 1 across OECD countries. Positive values indicated that the student showed a higher value of bullying victimisation at school than the average student in OECD countries.

Additionally, an interaction term was created with our focal independent variable (*bullying victimisation*) to analyse if the relationship between SWB and bullying victimisation was different in the case of *top performer* students and their peers. We created the binary variable *top performer* equal to 1 whether the student was a high performer and equal to 0 otherwise. PISA rated student performance on seven proficiency levels (from 0 to 6) where students scoring at the highest levels (5 and 6) in at least one area (maths, reading, or science) were considered top performers (OECD, 2019a). The share of *top performers* students was 8.80% in the total sample.

3.5 Control Variables

The covariates entered in the model were selected from the literature on the determinants of SWB. Regarding individual and family characteristics, we included gender, age, country of birth, and socio-economic status. *Gender* was captured by the binary question "Are you female or male?". Age was measured by the variable *Age*, measuring the age difference in months. To determine the *country of birth* students were asked, "In what country were you born?" with the answering categories "Country of test" and "Other country". *Economic, Social, and Cultural Status* was measured by the PISA index ESCS. This index was derived from three student indicators about the family background: parental highest occupational status, highest parental educational attainment, and home possessions.

Our model accounted also for school climate characteristics. We included *disciplinary climate, student co-operation, teacher support*, and *teacher feedback.*

The *disciplinary climate* was measured by the PISA index of disciplinary climate. The index was derived from student responses about how frequently ("every lesson", "most lessons", "some lessons" and "never or hardly ever") the following things happened: (1) "Students don't listen to what the teacher says"; (2) "There is noise and disorder"; (3) "The teacher has to wait a long time for students to quiet down"; (4) "Students cannot work well"; (5) "Students don't start working for a long time after the lesson begins".

The *student co-operation* was measured by the PISA index of student cooperation. This index was derived from student responses ("not at all true", "slightly true", "very true" and "extremely true") to the following statements: (1) "Students seem to value cooperation; (2) "It seems that students are co-operating with each other"; (3) "Students seem to share the feeling that co-operating with each other is important".

The *teacher support* was measured by the PISA index of teacher support. The index was derived from student responses about how frequently ("every lesson", "most lessons", "some lessons" and "never or hardly ever") the following things happened in their language-of-instruction lessons: (1) "The teacher shows an interest in every student's learning"; (2) "The teacher gives extra help when students need it"; (3) "The teacher helps students with their learning"; (4) "The teacher continues teaching until the students understand".

The *teacher feedback* variable was measured by the PISA index of teacher feedback. The index was derived from student responses about how frequently ("never or almost ever", "some lessons", "many lessons", "every lesson or almost every lesson") the following things happened in their language-of-instruction lessons: (1) "The teacher gives me feedback on my strengths in this subject"; (2) "The teacher tells me in which areas I can still improve"; and (3) "The teacher tells me how I can improve my performance".

The cross-national approach that we adopted required socio-economic data at the country level. So, we merged PISA data with data from the World Bank. Specifically, at the country level, we included *GDP per capita* and the *Human Capital Index 2018*. *GDP per capita (*corrected by purchasing power parity in constant 2017 dollars) referred to 2018 or the closest year available. The *Human Capital Index 2018* designed by World Bank (2018) calculates the contributions of health and education to worker productivity. The index's score (ranging from 0 to 1) measures the amount of human capital a child born today could expect to attain by age 18, given the risks of poor health and poor education that prevail in the country.

3.6 Analytic plan

PISA has established construct validity and measurement invariance across countries and within countries (in case of different languages within-country) through Item Response Theory modelling and specifically the generalised partial credit model (Muraki, 1992) (OECD, 2020). Thus, we can be confident that the students' scores can be compared both within and between countries. A Hierarchical Linear Model (HLM) was estimated to analyse the link between bullying victimisation and students' SWB. The data from PISA have a hierarchical structure. That is, students are grouped into schools, which in turn are grouped into countries. The HLM is suitable

for obtaining robust and unbiased estimators with nested data because it allows us to control for unobserved heterogeneity within each level (see Raudenbush & Bryk, 2002). This technique addresses the fact that students attending the same school may share some common characteristics not captured by the predictors included in the PISA database. The same will be true for the characteristics and teaching systems of schools in the same country. To address this issue, we estimated an HLM in three-levels (student, school, and country). Since our research questions do not require complex path analytic (mediation, moderated mediation) structural equation modelling (SEM) to be addressed, we did not estimate SEM models. The advantage of a SEM model in terms of accounting for measurement error through latent variables is not necessary here since the OECD PISA have extracted Weighted Likelihood (WLE) standardised estimates of the latent traits, which have very small bias in the estimates of the latent factors of each scale (Warm, 1989). Furthermore, a complex multiple-indicator multilevel SEM is impossible to estimate with ordered-categorical data, such as the current PISA data, given the need for computationally heavy numerical integration (Asparouhov & Muthen, 2007).

Additionally, we empirically examined the necessity of using HLM by computing the Intra-Class Correlation (ICC) values from the null models (a model composed only of the intercept, without any covariates). Results showed that 14.36% of the variation in students' life satisfaction occurred across schools and 5.47% across countries. Similarly, we found that 13.98% of the variation in the students' positive affect index occurred across schools and 4.63% across countries. These values corroborate the use of a multilevel approach in our study. As a general rule, a percentage of 5% indicates the need for applying HLM. By explicitly modelling the dependency between observations, unbiased standard errors and efficient estimates can be produced even with very small variance at the group level (Peugh, 2010). Further, the findings from the Likelihood-ratio test showed the HLM had a better fit ($p<.01$) for both overall life satisfaction and positive affect models compared to traditional model regression, providing additional support for applying HLM.

The HLM model we estimated was given by the following equations:

$$\begin{aligned} SWB_{ijk} = {} & ß_0 + ß_B BullyingVictimisation_{ijk} + ß_T TopPerformers_{ijk} \cdot BullyingVictimisation_{ijk} \\ & + ß_s \boldsymbol{Student_{ijk}} + ß_C \boldsymbol{Country_k} + \varepsilon_{ijk} \end{aligned} \tag{1}$$

$$ß_0 = \delta_{00} + \varphi_{0k} + \omega_{0jk} \tag{2}$$

In the first equation, Eq. (1), SWB_{ijk} was the expected SWB of student *i* enrolled in school *j* in a country *k*. $BullyingVictimisation$ was our key independent variable, reflecting the level of bullying a student suffers from. To obtain the best estimates of $ß_B$, our approach is to use our rich dataset by conducting the estimation at the individual student level to eliminate the most significant characteristics of students, schools and countries affecting SWB, collected by the vectors of control variables, $\boldsymbol{Student_{ijk}}$, $\boldsymbol{School_{jk}}$, and $\boldsymbol{Country_k}$.To test whether the relationship between bullying victimisation at school and SWB differs between top performers and their peers, we estimated an interaction term between $TopPerformers_{ijk}$ and

$Bullying\,Victmisation_{ijk}$, being $TopPerformers_{ijk}$ a binary variable which took a value of 1 if the student was considered a top performer.

Equation (2) model the school and country-specific intercepts and the associated complex error structure. ϕ_{0k} and ω_{0jk} were the respective deviations of the schools' and the countries' means from the overall mean δ_{00}. They were assumed to be normally distributed, with a mean of 0, and uncorrelated with ϵ_{ijk}.

Some missing data were identified at the student and school levels. However, in the case of working with such a large data sample as the one compiled by PISA, the results do not vary significantly by making the estimates with the original sample or by imputing the missing values (Fernández-Gutiérrez et al., 2020). Therefore, we used listwise deletion. All data analyses were performed using *Stata* 17 (StataCorp., 2021).

4 Results

4.1 Descriptive statistics and correlational and multicollinearity analysis

Table 1 reports the descriptive statistics of the variables referred to in this study. The average value of *overall life satisfaction* was 7.229. It ranged from 0 to 10, with a SD of 2.641. The average of the *positive affect* was 0.097, with an SD of 1.004. The average value of the index of *bullying victimisation* was 0.184. It ranged from − 0.782 to 3.859, with an SD of 1.109.

Figure 1 shows the bivariate correlation matrix. Correlations between the two measures of SWB and *bullying victimisation* were negative and significant ($p<.01$), with a value of − 0.16 both for *overall life satisfaction* and *positive affect*. All control variables were significant and also showed the expected signs previously noted in the literature review with both *overall life satisfaction* and *positive affect.*

Correlation coefficients shown in Fig. 1 were below Kline's (2011) collinearity cut-off of 0.85, indicating no collinearity problems. Additionally, the variance inflation factor (VIF) was employed. Results presented in Table A3 of the Supplemental Materials indicated that our regression models were unaffected by multicollinearity, as evidenced by VIF values remaining under the threshold of 5 (Kim, 2019).

4.2 Subjective well-being and bullying victimisation

Table 2 shows the results of the estimations of the system of Eqs. (1) and (2), with *overall life satisfaction* and *positive affect* as the dependent variables in columns 1 and 2, respectively. The estimations included the fixed- and-random-effects. The fixed effects account for the overall expected effects of the students', schools', and countries' characteristics on the student's *overall life satisfaction* and *positive affect*. The random effects indicate if this effect varies between schools and countries by showing the standard deviations from the overall mean, with origin in the school and country levels variances unaccounted for in the model.

The fixed effects analysis showed a significant and negative correlation between *bullying victimisation* and, first, *overall life satisfaction* ($p<.01$) and, second, *posi-*

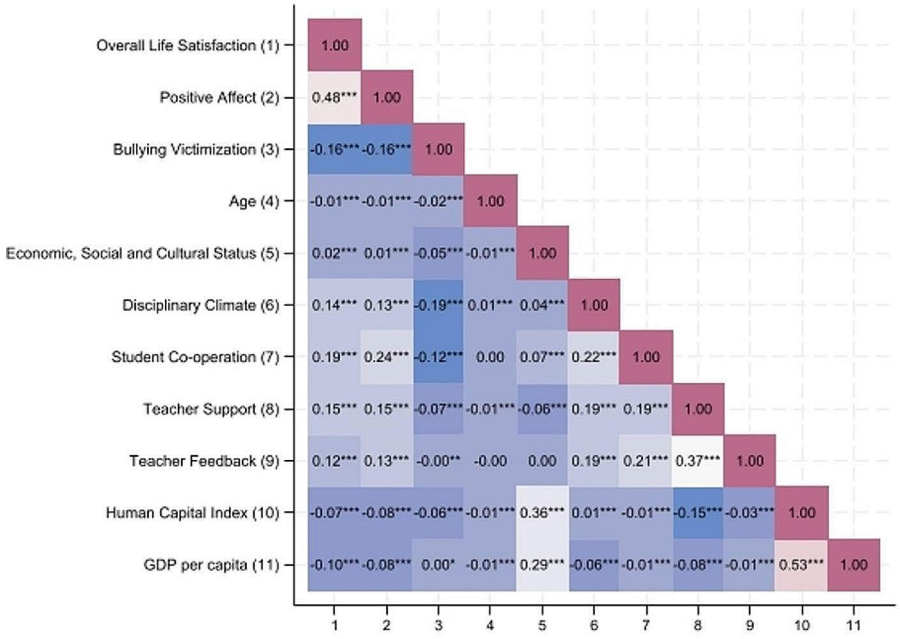

Fig. 1 Correlation Matrix. Note: *** $p<0.01$, ** $p<0.05$, *$p<0.1$

tive affect ($p<.01$). To assess the relative size of the effect of *bullying victimisation*, we calculated the interaction between the estimated coefficients and the SD of the predictors. An increase in the index of *bullying victimisation* of one SD, was associated with a decrease of 0.143 SD in *overall life satisfaction*, and 0.119 SD in *positive affect.*

In the case of the control variables, coefficients, signs, and significances were similar for both models, except for three variables: *male, age*, and *GDP per capita.* Specifically, at the student-level, we found that *being male* was positively and significantly correlated with *overall life satisfaction* ($p<.01$) but was not significantly correlated to *positive affect*. *Age* was negatively and significantly correlated with *overall life satisfaction* ($p<.1$) but was not significantly correlated to *positive affect. Students born in other country* different to the country of the test reported lower levels of *overall life satisfaction* ($p<.05$) and *positive affect* ($p<.01$). *Economic*, *social, and cultural status* was positively and significantly correlated with *overall life satisfaction* ($p<.01$) and *positive affect* ($p<.01$). *Top performers* showed lower and significant levels of *overall life satisfaction* ($p<.01$) and *positive affect* ($p<.01$). Additional results at the school-level showed that, *disciplinary climate*, *student co-operation*, *teacher support*, and *teacher feedback* were positively and significantly correlated with both *overall life satisfaction* ($p<.01$) and *positive affect* ($p<.01$). Finally, at the country-level, we found that the *Human Capital Index* was negatively and significantly correlated with both *overall life satisfaction* ($p<.05$) and *positive affect* ($p<.01$). The *GDP per capita* was negatively and significantly correlated with the *positive affect* ($p<.01$) but was not significantly correlated to *overall life satisfaction*.

Table 2 HLM Regressions. Dependent Variables: Overall Life Satisfaction and Positive Affect

Dependent variable	Overall life satisfaction	Positive affect	Overall life satisfaction	Positive affect
	(1)	**(2)**	**(3)**	**(4)**
Fixed-effects parameters				
Intercept	10.020***	1.264***	9.991***	1.254***
	(1.038)	(0.381)	(1.022)	(0.375)
Key independent variables				
Bullying victimisation	-0.351***	-0.110***	-0.336***	-0.105***
	(0.066)	(0.021)	(0.064)	(0.020)
Bullying victimisation*Top- performer			-0.222***	-0.069**
			(0.062)	(0.027)
Control Variables				
Student-level				
Gender				
Female	Base	Base	Base	Base
Male	0.395***	-0.025	0.396***	-0.025
	(0.063)	(0.023)	(0.063)	(0.023)
Age	-0.096*	-0.026	-0.095*	-0.026
	(0.054)	(0.021)	(0.052)	(0.020)
Country of birth				
Country of test	Base	Base	Base	Base
Other country	-0.125**	-0.079***	-0.127**	-0.080***
	(0.055)	(0.018)	(0.055)	(0.018)
Economic Social and Cultural Status	0.170***	0.057***	0.171***	0.058***
	(0.024)	(0.010)	(0.025)	(0.010)
Top-performer				
No	Base	Base	Base	Base
Yes	-0.167***	-0.156***	-0.173***	-0.157***
	(0.061)	(0.035)	(0.056)	(0.034)
School-level				
	(0.024)	(0.010)	(0.025)	(0.010)
Disciplinary climate	0.125***	0.041***	0.125***	0.041***
	(0.032)	(0.006)	(0.031)	(0.006)
Student co-operation	0.358***	0.172***	0.356***	0.172***
	(0.022)	(0.009)	(0.022)	(0.009)
Teacher support	0.237***	0.078***	0.237***	0.078***
	(0.036)	(0.007)	(0.036)	(0.006)
Teacher feedback	0.147***	0.063***	0.147***	0.063***
	(0.020)	(0.005)	(0.020)	(0.005)
Country-level				
Human Capital Index	-1.687**	-0.996***	-1.678**	-0.993***
	(0.817)	(0.310)	(0.816)	(0.310)
GDP per capita	-0.007***	-0.001	-0.007***	-0.001
	(0.002)	(0.001)	(0.002)	(0.001)
Random-effects parameters				
Country: Identity sd(_cons)	-0.725***	-1.715***	-0.724***	-1.716***

Table 2 (continued)

Dependent variable	Overall life satisfaction	Positive affect	Overall life satisfaction	Positive affect
	(0.113)	(0.102)	(0.113)	(0.102)
School: Identity sd(_cons)	-0.141***	-1.138***	-0.141***	-1.138***
	(0.043)	(0.045)	(0.043)	(0.045)
sd(Residual)	0.851***	-0.104***	0.851***	-0.104***
	(0.015)	(0.012)	(0.015)	(0.012)
Number of observations				
Students	329,015	325,539	329,015	325,539
Schools	15,903	15,567	15,903	15,567
Countries	64	63	64	63

Note: Robust standard errors adjusted for clustering at the country level are in parenthesis. Regressions weighted by students' sampling probability. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

At the bottom of Table 2 shows the results of the random effects, which were statistically significant ($p<.01$) among schools and countries. This shows that some school and country-level variances remain unaccounted for in the model, which justifies the inclusion of the school and country levels in the HLM.

4.3 Subjective well-being and bullying victimisation: the moderating role of top performers

Columns 3 and 4 show the estimations of the moderating role of the variable *top performer* in the relationships between SWB and *bullying victimisation*. Coefficients of the interaction term were negative and significant both for *overall life satisfaction* ($p<.01$) and *positive affect* ($p<.05$), indicating that the negative associations between *bullying victimisation* and both indicators of SWB were more pronounced for *top performer* students. Specifically, for *top performers*, an increase in the *index of bullying victimisation* of one SD was associated with an additional decrease of 0.090 SD in *overall life satisfaction*, and of 0.072 SD in *positive affect*, in comparison to the rest of the students.

5 Discussion

The present cross-country study aimed to contribute to the literature by exploring how bullying victimisation is associated with students' SWB, accounting for student-, school-, and country-level factors associated with students' SWB. Additionally, we explored whether being a high-attaining student moderated the relationship between bullying victimisation and SWB. To this end, we constructed a heuristic multilevel resilience model to address these issues, controlling for the potential multi-layered associations between background characteristics, school-level school climate factors, and country-level indicators.

5.1 The association between bullying victimisation and SWB

Although peer relationships play a critical role in adolescent adaptive functioning (Wentzel, 2017), research has also indicated that negative peer relationships, such as bullying victimisation, could reduce mental health (Wolke & Lereya, 2015) and well-being (Katsantonis et al., 2022). This appears to be the case in our study since we found that bullying victimisation was negatively associated with both overall life satisfaction and positive affect across countries.

The negative association can be explained in terms of the stress and coping model (Biggs et al., 2017; Lazarus & Folkman, 1984). Specifically, it is possible that the bullying victimisation experiences have been appraised as stressful, requiring efforts to handle these negative victimisation experiences. However, despite the existence of protective factors, the intensity of the bullying phenomenon might overwhelm their coping resources and, hence, the negative association between victimisation and SWB. From the school climate literature (Espelage & Hong, 2019; Wang & Degol, 2016), it becomes clear that the school climate might not be supportive enough to prevent bullying victimisation, which, in turn, predicts less life satisfaction and positive affect. The fact that this association persevered stringent statistical controls for other relevant protective factors suggests that educational researchers have not yet identified the collection of factors that can effectively mitigate the role of school bullying victimisation in reducing adolescents' SWB. This claim is further supported by separate research suggesting that there is not convincing evidence in favour of strongly effective programmes of bullying prevention (Juvonen & Graham, 2014).

Overall, the findings suggest that the research community needs to invest more effort to carefully study what educational and psychological factors are important for promoting adolescent students' SWB in the presence of bullying victimisation.

5.2 Bullying victimisation and SWB: The moderating role of high-performing students

The negative association between bullying victimisation and life satisfaction and positive affect is further compounded by the academic attainment of the students, as shown in our analyses. HLM modelling revealed that being a top performing student was exacerbating the negative effect of bullying victimisation on the two indicators of SWB. This is a noteworthy research aim given the inconclusive evidence regarding the association between academic performance and SWB, as well as the potentially moderating role of academic performance. To some extent, this finding coincides with evidence indicating a negative association between SWB and high academic performance (Bortes et al., 2021; Heller-Sahlgren, 2018) and contradicts empirical research suggesting otherwise (Bücker et al., 2018). Moreover, our results suggest that being a top performer student is a risk factor for bullying victimisation.

There are several potential explanations for this observed effect, yet few studies have examined whether students' academic attainment levels are predictive of the victimisation experiences of students (Bergold et al., 2020). A potential explanation of this finding comes from the work of Schwartz et al. (2005). Following these authors' argument top academic performance might be on average inconsistent with

the normative values of the particular peer groups, which might lead to unpopularity and social rejection, propagating, thus, victimisation (Schwartz et al., 2005). It is commonly agreed that high performing students are under constant academic pressure leading to social comparisons and competitiveness in the peer group (Luthar et al., 2020). This kind of educational attainment accompanied by a school culture of competitiveness and comparisons can easily exacerbate victimisation incidents in adolescents (Di Stasio et al., 2016). Another account suggests that top performing gifted students struggle with loneliness and feelings of isolation and sadness but teachers are not necessarily able to identify that these students are struggling with socio-emotional problems (Vialle et al., 2007). This indicates that top performing students might be 'easy prey' for the bullies because of their already socio-emotional maladjustment (Vialle et al., 2007). Nevertheless, more longitudinal research is needed to delve deeper into the cause and effect of these relations and particularly within groups of high and top performing students.

5.3 Linking student-, school-, and country-level indicators with student SWB across countries

Although not of main importance, we statistically controlled for a range of covariates that could potentially function as protective factors against SWB declines. In the section below, we discuss the findings of the covariates.

The results of the analyses revealed that females exhibited lower overall life satisfaction. This finding is in line with past evidence showing a gender gap in life satisfaction (Chen et al., 2020; Katsantonis et al., 2022). However, it is noted that we did not find evidence for such an association between gender and positive affect, suggesting that the gender gap in SWB seems to be component specific. Additionally, our results verified preceding empirical evidence indicating a decline in life satisfaction with age (Brooks et al., 2020). Similar to our findings regarding gender, this statistically significant relationship seems to be component specific, too, since the HLM did not reveal any statistically significant relationship between positive affect and age. Our results also align with the empirical studies indicating that coming from an immigrant background was associated with lower life satisfaction and positive affect (Borraccino et al., 2018; Tang, 2019). As reported by preceding research (Shackleton et al., 2018), we also found evidence in favour of a social gradient in both life satisfaction and affect, indicating that having better resources and cultural capital was associated with inflated levels of SWB.

Regarding the potential influence of school climate, our findings also corroborate with evidence suggesting that positive and supportive school climate is a strong protective factor against reduced SWB. The multilevel modelling illustrated that having better levels of disciplinary climate, student co-operation, teacher support, and teachers' feedback in schools was linked with greater life satisfaction and positive affect. These findings cement the idea that a supportive school climate is crucial for fostering positive peer and teacher-student relationships and preventing problematic behaviours, such as school bullying (Mischel & Kitsantas, 2020; Thapa et al., 2013).

Finally, the present study contributes to the cross-country comparative literature since we explored additionally the associations between two important country-level

indicators, namely human capital index and GDP per capita. It is necessary to stress the importance of accounting for country-level factors too, since macro-characteristics of the countries are known to influence people's health outcomes (Ran et al., 2023). Our analyses revealed that countries with higher economic development, measured by their stocks of human capital and GDP per capita, have less satisfied adolescent students who feel less positive. This finding is quite unique since some studies with children have reported no such evidence (e.g., Lee & Yoo, 2015), and other studies with adults have reported mixed evidence either in favour of a positive moderated relationship (e.g., Mikucka et al., 2017) or in favour of a negative association (Rudolf & Bethmann, 2023).

5.4 Implications for policy and practice

The present findings are undoubtedly insightful for policymakers and educationalists. First, teachers and support staff in schools should be vigilant to prevent any bullying victimisation experiences given the deleterious effects of bullying victimisation on adolescent students' SWB. Due to the protective effect of having a supportive school climate in promoting adolescent students' SWB, we recommend systematic implementation of educational policies that would be able to improve and sustain a positive and supportive school climate. In line with theoretical evidence (Gregory et al., 2010; Mischel & Kitsantas, 2020; Wang et al., 2013), this could include building and maintaining a good disciplinary authoritative climate and a supportive social environment. Furthermore, the study highlights the importance of school-wide, but context-sensitive, educational interventions to prevent and reduce the likelihood of school bullying victimisation experiences, especially in highly economically developed countries, where SWB seems to be on the decline.

5.5 Limitations

The present study suffers from some limitations that must be acknowledged. Firstly, we measured well-being through a single-item measure of overall life satisfaction, which may be more vulnerable to random measurement errors, and its internal consistency reliability statistic cannot be computed. However, the empirical literature contains many examples of single-item measures focused on subjective well-being (Sandvik et al., 2009), demonstrating an acceptable balance between practical needs and psychometric concerns. Secondly, the index of bullying victimization is based on self-report student measures. Even though self-report measures are well-established in the literature on bullying victimization, self-reports can be sensitive to response biases such as recall and social desirability bias, which might lead to underreporting bullying victimization (Buchholz et al., 2022). Thirdly, the cross-sectional nature of our data does not permit the examination of well-being over time to be able to make claims of causality. Further research based on longitudinal data is needed to explore the causal relationship between SWB and bullying victimization. Finally, another sample limitation is related to the representativeness of the countries included in the analysis. In particular, emerging and low-income countries are underrepresented or

not included (e.g., African countries) in the PISA (Tuttle et al., 2023), which limits the scope of our findings.

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Availability of data The data are publicly available at: https://www.oecd.org/pisa/data/2018database/

Declarations

Ethics statement The study was conducted in accordance with the Declaration of Helsinki. The PISA study has received ethics approval from the responsible institutions within each participating country.

Conflict of interest None.

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Authors and Affiliations

Ioannis Katsantonis[1] · Beatriz Barrado[2] · Ros McLellan[1] · Gregorio Gimenez[3]

Ioannis Katsantonis
ik388@cam.ac.uk

Beatriz Barrado
bbarv@unileon.es

Ros McLellan
rwm11@cam.ac.uk

Gregorio Gimenez
gregim@unizar.es

[1] Faculty of Education, University of Cambridge, Cambridge, UK

[2] Faculty of Economics and Business Studies, University of Leon, Leon, Spain

[3] Faculty of Economics and Business Administration, University of Zaragoza, Zaragoza, Spa
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