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Predictors of adolescent well-being during school closures: a systematic review and secondary analysis of REDS data from Slovenia

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Introduction: The COVID-19 pandemic and prolonged school closures disrupted students' daily lives, exacerbated existing challenges, and negatively impacted adolescent well-being.

Methods: This study identifies predictors of adolescent well-being during school closures by combining a systematic review of international research with a secondary analysis of data from a representative sample of Slovenian students (who experienced some of the longest school closures in Europe, resulting in a deterioration in well-being).

Results: The findings suggest that adolescent well-being is the result of a dynamic interplay between individual, social, and environmental factors, with the relative influence of these factors varying between crisis and non-crisis contexts. Identified risk factors included, among others, female gender, low socioeconomic status, mental health difficulties, loneliness, disrupted daily routines, and elevated anxiety, whereas emotional regulation, adaptive coping, and perceived social support functioned as salient protective factors. Environmental stressors, including lockdown measures, home environment constraints, and exposure to infection, further exacerbated psychological distress. The Slovenian study demonstrates how national and cultural contexts can affect these results further, with some predictors, such as physical activity and anxiety, displaying mixed associations with well-being.

Discussion: These findings emphasise the need for context-sensitive, multi-level interventions that foster autonomy, competence, and connectedness to sustain adolescent well-being during stable periods and crises, and to inform future school and health policies.

KEYWORDS

well-being, adolescence, predictors, COVID-19, systematic review, REDS, regression models

1 Introduction

The COVID-19 pandemic profoundly disrupted everyday life across the globe, affecting individuals, families, and institutions on multiple levels (WHO—World Health Organization, 2020). Beyond the immediate health crisis, the pandemic brought about social isolation, economic instability, and unprecedented changes to education systems. School closures affected over 1.5 billion students worldwide (UNESCO, 2023). Consequently, there has been a growing focus on understanding the impact of these disruptions on the mental health and well-being of young people (e.g., Loades et al., 2020). This article focuses on the well-being of Slovenian adolescents during COVID-19-related school closures, examining the extent to

which different factors (as identified in international literature) shaped their experiences. Although the literature identifies a wide range of contributing factors, their impact is often context-dependent and may not exert the same influence within Slovenia's specific social and educational environment.

The COVID-19 pandemic has significantly affected lives worldwide, with varying degrees of impact across different social groups (e.g., age and gender; Gibson et al., 2021). Its psychological consequences have been widely documented, with studies reporting elevated levels of depression, anxiety, and stress among both adults (e.g., Cénat et al., 2021; Salari et al., 2020) and young people (e.g., Maggu et al., 2023; Mansfield et al., 2021; Raccanello et al., 2023). Eurofound (2021) highlights that the crisis disproportionately affected the life satisfaction and mental well-being of young people compared to older age groups, underscoring the vulnerability of adolescents during this period. Amidst COVID-19-related school closures, students have encountered various challenges, including the abrupt transition to distance learning, a diminished sense of social connectivity, and the need to navigate technological obstacles (e.g., Lemay et al., 2021). Consequently, the impact on their mental health and overall well-being has become more pronounced (e.g., Raccanello et al., 2023).

Government-imposed measures, such as restrictions on mobility, the closure of face-to-face education services and the cancellation of social gatherings, have led to widespread social isolation. Loneliness, or perceived social isolation, not only heightens alertness to potential threats and increases vulnerability and craving for social connections (Hawkey and Cacioppo, 2010), but it also poses serious risks comparable to other well-known mortality factors, such as physical inactivity, obesity, and substance abuse (Holt-Lunstad et al., 2015). Among children and adolescents, research has shown a particularly strong connection between loneliness and mental health problems, with effects persisting even up to 9 years later (Loades et al., 2020; Lyyra et al., 2021). Reduced social interaction and support during school closures disrupted adolescents' peer relationships and sense of belonging, leading to higher loneliness levels strongly linked to poorer well-being (Farrell et al., 2023). Thus, the pandemic affected not only mental health but also subjective well-being and overall quality of life (OECD, 2021).

Well-being – a multifaceted concept encompassing physical, psychological, and social dimensions (at individual, relational, and collective levels; Evans and Prilleltensky, 2007) – is paramount in understanding individuals' overall quality of life. It goes beyond the mere absence of illness and includes feelings of life satisfaction, an individual's engagement in meaningful activities, the quality of their relationships and a sense of purpose in life. Researchers often describe its multidimensional aspect using models such as the PERMA model (positive emotion, engagement, relationships, meaning, and accomplishment) developed by Seligman (2011) or try to capture the subtle differences in aspects of the overarching concept of well-being. While research often distinguishes between psychological, subjective, physical, emotional, and cognitive well-being (Davidson and McEwen, 2012; Diener et al., 1999; Kesebir and Diener, 2008; Ryff and Singer, 2008; Seligman, 2002; WHO—World Health Organization, 2020), these categories frequently overlap, with many scholars acknowledging the complex interplay between these dimensions in shaping overall well-being. Psychological well-being includes the eudaimonic aspect and emphasizes meaning, growth, and self-fulfillment, while subjective well-being takes a hedonic approach and focuses on

happiness and life satisfaction. Physical well-being, the most biological dimension, concerns the body's health and the absence of disease. Emotional well-being, which is closely linked to subjective well-being, specifically addresses daily emotional experiences, and cognitive well-being focuses on mental function and clarity, impacting emotional regulation and psychological resilience. So, although these dimensions are all interconnected, they emphasize different aspects of human experience, trying to provide a holistic view of well-being. However, they tend to downplay the social dimension of well-being a bit. Social relationship variables, such as social support and social integration, have a big influence on health and well-being by buffering stress and promoting positive psychological states (Cohen, 2004; Holt-Lunstad et al., 2015).

Adolescence, marked by physical, psychological, and social changes, already follows dynamic changes in well-being, with strong social support and positive relationships being key to higher well-being, while mental health challenges pose significant risks (Berkman and Glass, 2000; Steinberg, 2014). Therefore, it is not surprising that restrictions on face-to-face social contact led to a significant increase in loneliness compared to pre-pandemic levels (Entringer and Gosling, 2022), which affected the well-being of adolescents (Hunter et al., 2023). While it is common for adolescents to experience normative stressors (e.g., academic demands, pubertal development), non-normative events that affect a smaller group and occur less predictably (e.g., loss of close relatives, natural disasters) can also take a toll (Lau, 2002). The COVID-19 pandemic, a notable non-normative stressor that affected the entire globe and caused chronic stress, has significantly increased the challenges faced by everyone, especially adolescents (Holder and Blaustein, 2014). Research by Schwarzer and Schulz (2003) suggests that such disasters often have a more pronounced negative impact on adolescents, particularly in developing countries. Furthermore, negative life experiences during adolescence can have lasting consequences, including an increased risk of developing mental health problems (e.g., Mann et al., 2014).

The effects of the pandemic on adolescents' mental health, education, and daily life were profound, both in the short term and the long term. During the pandemic, a decline in young people's mental health and well-being has been observed, manifesting in increased levels of stress, loneliness, anxiety, and depression, with potential long-term consequences (Maggu et al., 2023; Mansfield et al., 2021; Raccanello et al., 2023). School closures also led to a significant decline in all forms of physical activity (Ludwig-Walz et al., 2023) and notable learning losses, particularly among disadvantaged students (Betthäuser et al., 2023). Moreover, the negative impact on students' mental health was diverse and also varied across student subgroups and countries (Meinck et al., 2022), which highlights the need to recognise commonalities while allowing space for context-specific analysis and interventions. Although many adolescents' mental health improved once restrictions were lifted (Breaux et al., 2021), a substantial proportion continue to experience ongoing psychological distress, academic challenges, and diminished well-being (Betthäuser et al., 2023; Wolf and Schmitz, 2024). Increased substance use, disruptive behavior, and mental health problems such as heightened stress, psychosomatic symptoms, and depressive or anxiety disorders have also been reported to persist among some adolescents (Wolf and Schmitz, 2024). Overall, the pandemic has exacerbated pre-existing inequalities and emphasised the importance of long-term mental health and educational support to promote well-being and resilience in young people.

As we delve into the realm of well-being, it becomes imperative to examine its dynamics across various groups and, more specifically, to unravel the well-being predictors affecting students. Examining the predictors of well-being provides a lens through which we can better understand the factors shaping students' well-being during the unprecedented times of the COVID-19 pandemic. WHO—World Health Organization (2020) lists a variety of factors contributing to young people's health and well-being, such as the social context (e.g., relations with family, peers, school and online communication), health outcomes (e.g., subjective health), health behaviors (e.g., physical activity) and risk behaviors (e.g., fighting and bullying). Layard (2005) emphasized the significance of relationship quality when identifying the most important factors impacting well-being (family relationships, financial situation, work, community and friends, health, personal freedom and personal values). Satisfaction and frustration in the basic psychological needs [i.e., need for autonomy, competence, and relatedness; according to the Self-determination theory by Ryan and Deci (2017) might also have a key role in obtaining optimal well-being (Šakan et al., 2020)]. Research also indicates a positive association between well-being and the perception of residing in trustworthy environments (Helliwell et al., 2014), as well as democratic and stable governance (Dorn et al., 2007). On this note, White (2010) also views well-being as both an individual and societal aspiration, underscoring education as a pivotal mechanism for its efficient promotion. Schools and teachers, therefore, play a critical role in fostering well-being, promoting personal fulfilment, and preparing individuals to become catalysts for societal change. They have also been recognized as vital in supporting local communities, families, and students, particularly those who are vulnerable or from marginalized backgrounds (O'Toole and Simovska, 2022). Additionally, personal characteristics, such as age, gender, and socioeconomic status (SES), further shape well-being, with notable declines during adolescence, particularly for girls and economically disadvantaged individuals. More specifically, well-being manifests differently throughout various life stages. While studies indicate an increase in well-being with age, being almost stable between ages 16 and 23 and approaching a maximum around age 75 (Biermann et al., 2022), the opposite trend is observed in adolescence, marked by a decline in well-being from early to mid-adolescence (Yoon et al., 2023). Gender differences in well-being also surface during early adolescence (12–15 years), which are not observed in children (Michel et al., 2009). These gender differences tend to increase with age, showing a distinct decline noted for girls, especially those facing disadvantages (e.g., economic, social, educational; WHO—World Health Organization Regional Office for Europe, 2020), while boys exhibit relatively stable levels (Yoon et al., 2023). As mentioned, socioeconomic factors also play a significant role, as adolescents from wealthier families report better well-being (and also better communication with parents and higher levels of family and peer support), while those with unemployed parents or from immigrant backgrounds experience poorer well-being (WHO—World Health Organization, 2020).

All of the above shows that well-being is connected to a spectrum of elements, ranging from personal characteristics (e.g., gender), internal factors (e.g., individual's needs, affects, and traits), to external elements, such as support systems in students' lives (e.g., family, peers), the environments they live in, and even the governance the country is led on. As can be seen, some disparities in adolescent

mental well-being were evident in Europe even before the pandemic. Additionally, significant variations in adolescents' well-being across European countries underscore the importance of national contexts in shaping youth's well-being (Michel et al., 2009; WHO—World Health Organization, 2020). According to Bioecological Systems Theory (Bronfenbrenner, 2005), individuals are influenced by both their personal characteristics and their environment. Therefore, a comprehensive approach is crucial when examining potential predictors of well-being. These factors may differ between »normal« and crisis situations, as stressors during events such as the pandemic can alter or amplify their significance, highlighting the importance of considering context-specific determinants. Social isolation, for example, is not a common occurrence in normal circumstances but becomes a significant predictor of psychological distress and reduced well-being among adolescents during school closures (Loades et al., 2020). Moreover, new determinants emerge in crisis contexts, including a lack the resources to deal with distance learning (e.g., digital tools), chronic uncertainty, and psychological resilience, all of which can strongly influence well-being (Masten and Motti-Stefanidi, 2020). Therefore, incorporating crisis-specific predictors is essential for understanding the dynamics of well-being, identifying the most vulnerable groups, and developing targeted interventions to support adolescents effectively.

Needless to say, the well-being of students came into even more focus during the pandemic, especially in countries such as Slovenia, which experienced some of the longest school closures in Europe and above the global average (Križaj et al., 2021). Even before the pandemic, one of the key recognized challenges in the field of education in Slovenia was the establishment of a holistic approach to the well-being of students as well as the school staff (Urad za razvoj in kakovost izobraževanja, 2020). The well-being of Slovenian students declined during the pandemic-related school closures, with more than half of them reporting increased loneliness (53%) and sensitivity to minor disturbances (51%), while nearly half (37%) did not feel like contacting their friends (Klemenčič Mirazchiyski et al., 2021). Another study conducted in Slovenia during the pandemic showed that primary school students' psychosocial well-being (indicated by perceived proximity and support from teachers and classmates) was influenced by student resilience, teacher-led group work, student-teacher contact outside school hours, and online interactions with classmates (Pečjak et al., 2021). However, no representative sample has yet been used to explore the well-being predictors in depth, and this study is the first one.

To better understand student well-being during the COVID-19 pandemic, probable predictors on all levels must be considered (at individual, relational, and collective levels), thus revealing a spectrum of factors contributing to overall well-being. This study aims to provide a comprehensive overview of predictors of well-being during school closures by combining two complementary approaches: a systematic review of the international literature and an analysis of data from a representative sample of Slovenian students. The systematic review allows the identification of robust, globally observed patterns and risk/protective factors related to student well-being during the pandemic. In contrast, the empirical analysis of Slovenian data allows for a nuanced understanding of how these factors manifest in the specific national and cultural context. The combination of both approaches is essential to ensure that future strategies for crisis management in Slovenian primary schools are both evidence-based

and contextually relevant, bridging generalizable knowledge with local needs. The age range of 12–15 was chosen because, as already mentioned, the early to mid-adolescent period involves significant emotional and social sensitivity (Towner et al., 2023) and is often accompanied by a noticeable decline in overall well-being (Yoon et al., 2023). This developmental stage also sees the emergence of gender differences in well-being that are not typically present in younger children (Michel et al., 2009). Therefore, paying careful attention to adolescents' emotional and social well-being during this period is crucial. Focusing on this group enables a deeper understanding and more targeted support of adolescents' well-being, especially in the context of disruptions such as the COVID-19 school closures.

Research questions:

Which factors were identified in the existing literature as key predictors of well-being among students aged 12–15 during the school lockdowns caused by the pandemic? (Study 1: a systematic review).

How did various factors (as recognized by the systematic review; e.g., personal characteristics, social support) affect the well-being of primary school students during the school lockdowns in Slovenia? (Study 2: a secondary analysis of data from Slovenia).

Which protective and risk factors influencing student well-being were identified in Slovenia and internationally, and how can these findings inform future crisis response strategies (e.g., policies and interventions) in primary schools? (Studies 1 and 2).

2 Materials and methods

2.1 A systematic review

The literature search followed a systematic approach and followed the recommendations of the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA, Page et al., 2021). The review and its protocol were not previously registered.

2.1.1 Literature search strategy

The literature search was conducted in February 2024 using the following electronic databases covering psychology, education, and health research: Academic Search Complete, APA PsycArticles, APA PsycInfo, ERIC, SocINDEX with Full Text and MEDLINE. The databases were accessed via the EBSCOhost Research Databases interface.

A systematic search was performed using the following search strings, based on the purpose of the paper and specific inclusion criteria: “(well-being OR wellbeing OR well being) AND (predictors

OR indicators OR factors OR determinants) AND (COVID-19 OR coronavirus OR pandemic OR COVID) AND (lockdown OR isolation OR quarantine OR shutdown OR stay at home order) AND (adolescents OR teenagers OR teen OR youth OR students OR 12–15 years old).” We included the following limitations in our search: (i) peer-reviewed publications, (ii) publication years: 2020–2023, (iii) language: English, (iv) study type: quantitative or mixed-methods, (v) population: adolescents (including samples covering ages 12–15 years).

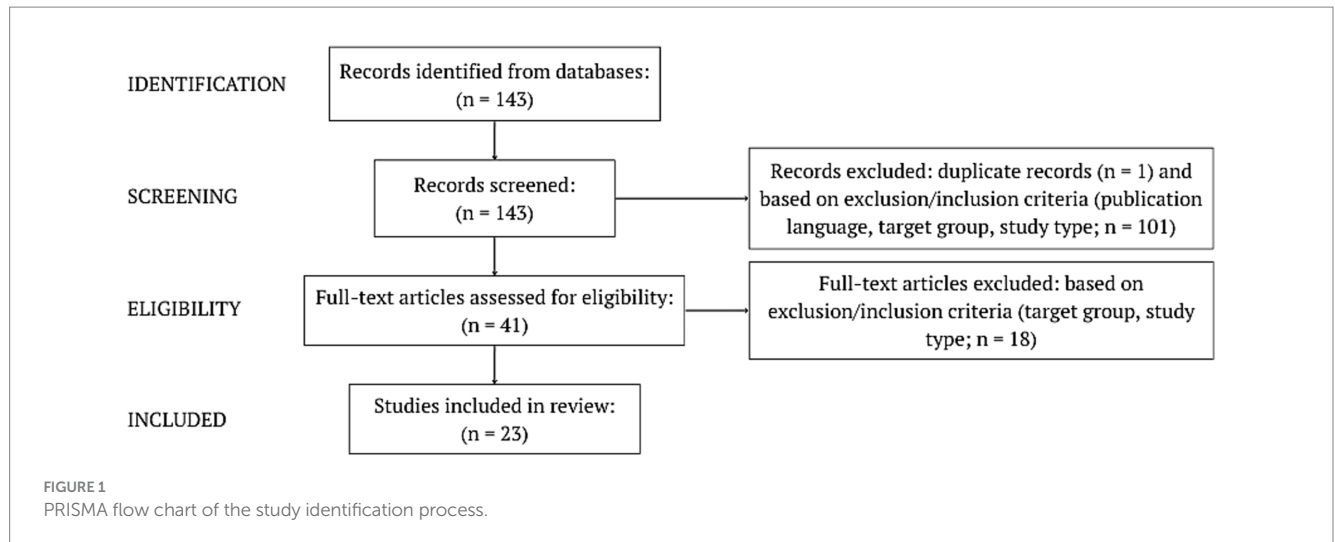
2.1.2 Study selection process

The systematic review followed predefined inclusion and exclusion criteria to ensure consistency and relevance. Studies were included if they met the criteria outlined in Table 1. Eligible studies focused on adolescents aged 12 to 15 years, as this group is considered particularly vulnerable (e.g., Michel et al., 2009; Towner et al., 2023; Yoon et al., 2023) and employed quantitative or mixed-methods approaches. In mixed-methods studies, only the quantitative analysis results were considered for inclusion. Only peer-reviewed articles published in English between 2020 and 2023 were included. Studies had to examine predictors of adolescent well-being during COVID-19-related school closures. Studies were excluded if they involved participants outside the specified age range, included clinical populations, relied solely on qualitative methods, were not published in English, or did not focus on predictors of well-being during pandemic-related school closures.

The study selection followed a three-step process: (1) database search and removal of duplicates; (2) title and abstract screening based on inclusion/exclusion criteria by two independent reviewers; and (3) full-text review by two independent reviewers and resolution of discrepancies through discussion. The first step of the search process was conducted using EBSCOhost, accessing the following databases: Academic Search Complete, APA PsycArticles, APA PsycInfo, ERIC, SocINDEX with Full Text and MEDLINE. Automation tools were used for duplicate removal. A total of 143 articles were identified. In the second step, to prevent potential bias in the selection process, two independent reviewers screened the abstracts of all identified articles to assess their relevance according to the predefined criteria (see Table 1). In cases where there was a disagreement on inclusion or exclusion, a discussion was held to reach a consensus on whether the article should proceed to a full-text review. After this process, 101 articles were deemed ineligible, and 1 duplicate was removed, resulting in 102 articles being excluded. Following the initial screening, 41 articles proceeded to full-text review. After the full-text review, again done by two independent reviewers, 23 articles were retained for the final analysis (see reasons for exclusion in Figure 1). Any doubtful

TABLE 1 Inclusion and exclusion criteria for the review.

Category	Inclusion criteria	Exclusion criteria
Participants	Adolescents aged between 12 and 15 years	Specified age range not included Clinical populations
Study type	Quantitative or mixed-methods studies	Qualitative studies
Publication	Peer-reviewed articles published between 2020 and 2023	Articles published outside the specified timeframe
Language	English-language publications	Articles not published in English
Research focus	Studies examining adolescents' predictors of well-being during the COVID-19-related school closures	Articles not including the timeframe of the COVID-19 pandemic and school closures Articles not focusing on well-being and its predictors



cases were resolved through discussion. The study selection process can be seen in [Figure 1](#).

2.1.3 Data extraction and synthesis process

In the process of conducting analyses for the systematic review, the key data of the included studies were summarized (see [Table A1](#) in [Supplementary materials](#)). All studies were reviewed following the objectives of this systematic review, which aimed to provide a comprehensive overview of research on predictors of adolescent well-being during COVID-19-related school closures. Findings were synthesized narratively, considering differences in study design, population, and measured outcomes. Key study details were extracted from full-text articles in a structured table, which included: (i) bibliographical details (study title, authors, year of publication), (ii) study type (quantitative or mixed-methods) (iii) aim of the study (research questions), (iv) sample characteristics (age, gender, country of origin), (v) methodology description (questionnaires and scales used, study duration), (vi) results (predictors and key findings relevant to the purpose and objectives of the present systematic review), and (vii) limitations of the study. The main focus of our study was predictors of well-being in the included studies. After the initial extraction, we categorized the predictors into common themes based on their content, and then further grouped these themes into individual (student-related), social (relationship-based), and environmental (context-related) predictors of adolescents' well-being during COVID-19 school closures.

2.2 REDS data analysis from Slovenia

2.2.1 Participants

This study draws on data from a representative sample of 2,552 eighth-grade students (48.63% female, 51.37% male) from 136 primary schools across Slovenia who participated in the Responses to Educational Disruption Survey (REDS) in 2021. The majority of students in the population have Slovenian as their first language (87.05%). The students came from diverse socioeconomic backgrounds: 6.59% were from a low socioeconomic background, 44.83% from a middle, and 48.58% from a high socioeconomic background ($M_{SES_IT} = 52.42$, $SE = 0.38$).

2.2.2 Procedure

The data used were collected in the international Response to Educational Disruption Survey (REDS) ([Meinck et al., 2022](#)), conducted by UNESCO (United Nations Educational, Scientific and Cultural Organization) and the IEA (International Association for the Evaluation of Educational Achievement) in 2020–2021 across 11 educational systems (Burkina Faso, Denmark, Ethiopia, India, Kenya, Russia, Rwanda, Slovenia, UAE, Uruguay, and Uzbekistan). The main objective of REDS was to examine how countries addressed the challenges their education systems faced in providing schooling to their students under the difficult circumstances of the COVID-19 pandemic, in order to provide policymakers and educational leaders with evidence-based information for decision-making. REDS 2021 uses a two-stage stratified random sampling method. In the first stage, schools were sampled with probability proportional to size (PPS sampling), based on the number of 8th-grade students. In most countries, 150 schools were sampled. The Slovenian school sample consisted of 136 schools. In the second stage, students and teachers were sampled, with one class randomly selected from each school, along with 20 teachers from the target grade ([Meyer et al., 2022](#)). This ensured large, nationally representative samples of schools, students, and teachers.

Schools in Slovenia were closed due to the pandemic for 23 weeks, which is above the world average ([Križaj et al., 2021](#)). The first wave of the pandemic in Slovenia began on 4 March 2020 with the confirmation of the first case of the virus. In response, the government closed all primary schools on 16 March, moving teaching entirely online. Other restrictions included suspending public transport, closing non-essential services such as bars and restaurants, limiting movement to one's municipality of residence and closing national borders. As the epidemiological situation improved, schools gradually reopened before the end of the 2019/20 school year. Students in grades 1–3 returned on 13 May; those in grade 9 on 18 May; those in grades 4–5 on 25 May; and those in grades 6–8 on 3 June, 2020. This phased reopening enabled schools to implement health and safety measures while resuming in-person education. The REDS field survey was initially planned for November and December 2020, but was postponed due to the epidemiological situation to the period from 16 February to 9 April 2021. In Slovenia, the questionnaires were

primarily administered online. However, to accommodate schools with limited computer access, paper-based versions of the questionnaire identical to the online version were also offered to students. The reference period was specified in the questionnaires as 'school closures during the first wave of the Covid-19 epidemic,' and the exact date on which schools reopened after this period was provided (Klemenčič Mirazchiyski et al., 2021). On 15 February, all primary school pupils returned to school, except where school holidays applied. In line with health measures, teaching was organised into fixed "bubbles" corresponding to each class. Both class and subject lessons took place in the same classroom, which pupils did not change (Križaj et al., 2021).

2.2.3 Instruments

The 2021 REDS survey gathered diverse data on participants' backgrounds and their perceptions of life aspects affected by the COVID-19 pandemic. The variables cover school organization, teaching, challenges and changes in teaching and learning processes, as well as the well-being of students and teachers, and measures to maintain well-being at school. Students, teachers and principals answered separate questionnaires. In this study, only data from the student questionnaire are included. The students answered groups of questions focused on specific topics, as outlined by UNESCO and IEA (2022): teaching and learning during school closures; well-being during the closure; perception of their own learning and academic performance; schooling after the closure; long-term impacts; and questions related to students' families.

2.2.3.1 Well-being measures

The well-being of students in the REDS study is assessed using items from two questions (Q24 and Q25). The first question explores various emotions experienced during the pandemic (e.g., feelings of anxiety, support, and belonging). The second question addresses students' overall well-being during the pandemic (e.g., feeling fit and healthy). Students answered questions "To what extent do you agree or disagree with the following statements about (Q24) how you felt during the COVID-19 disruption; (Q25) your well-being during the COVID-19 disruption?" All items were answered on a 4-point Likert scale (1: Strongly agree; 2: Agree; 3: Disagree; 4: Strongly disagree). As most of the items were positively worded and their response categories were coded from high to low (i.e., "Strongly agree" is the lowest and "Strongly disagree" is the highest), they have been reverse-coded, so that "Strongly agree" is the highest and "Strongly disagree" is the lowest category. Statements D-J in question 25 were left in their original metric, as these were negatively worded or are oriented toward negative feelings or attitudes. This way, the measurement metric of all variables was set to be in the same direction. The items and their corresponding labels (with "R" indicating reverse-coded items) from the international student questionnaire used to assess various constructs in this study are presented in Table B1 in Supplementary materials, along with the factor loadings from the exploratory factor analysis (EFA). See the next subsection (2.2.4) for details on the analysis.

Five scales were constructed based on the content of the items representing each factor. Two of them cover well-being (i.e., social and emotional well-being) while three cover mental and physical health (academic and COVID-19 anxiety, physical engagement). Social well-being assesses students' sense of connectedness and support within

their school environment, including relationships with peers, teachers and school staff (e.g., "I felt supported by my school"). Emotional well-being measures changes in emotional states such as increased anger, sadness, loneliness and disturbed sleep patterns. It also captures the impact of increased social media use (e.g., "I got upset over things that would not have normally bothered me."). Academic anxiety measures how school disruption and the COVID-19 pandemic affected students' anxiety about academic performance and concentration. Items reflect concerns about learning progress and future education, as well as difficulty concentrating on schoolwork (e.g., "I was worried about how the disruption affected my learning."). COVID-related anxiety focuses on anxiety and stress related to the pandemic, including its impact on local and global communities and concerns about personal and family health (e.g., "I felt overwhelmed by what was happening in my local area due to the COVID-19 pandemic"). Physical engagement assesses students' levels of physical activity and perceptions of their physical health, as well as their participation in extra-curricular activities (e.g., "I exercised (including walking) more than usual").

Factor loadings for all constructs demonstrated fair to excellent associations with their respective latent constructs (Tabachnick and Fidell, 2006). Emotional well-being loadings ranged from 0.42 to 0.80, social well-being from 0.42 to 0.68, physical engagement from 0.60 to 0.75, academic anxiety from 0.43 to 0.74, and COVID-19 anxiety from 0.52 to 0.76 ($p < 0.001$). The internal consistency of each construct was supported by adequate to good reliability. Cronbach's alphas were 0.78 for emotional well-being, 0.75 for social well-being, 0.71 for physical engagement, 0.81 for academic anxiety, and 0.79 for COVID-19 anxiety.

2.2.3.2 Well-being predictors

Emotional and social well-being were used as dependent variables, while academic anxiety, COVID-19-related anxiety, and physical engagement served as predictors. In addition, several other variables from the student questionnaire were included as predictors of well-being constructs (see Table B2 in Supplementary materials).

Individual factors included as the predictors of well-being cover gender (1 = girl, 2 = boy) and socioeconomic status. An original SES variable (SES_IRT) was used, representing a continuous scale constructed using Item Response Theory (IRT). For more information on how the original variable was constructed, please refer to the REDS User Guide (UNESCO and IEA, 2022). Additionally, three of the newly constructed scales (average of items) were included as constructs covering mental and physical health (i.e., academic anxiety, COVID-19 anxiety, physical engagement).

Social factors included as the predictors of well-being covered the support given by teachers and the school. Items from two questions were employed. Teacher support (Q21) captures students' perceptions of the support provided by their teachers during the COVID-19 disruption (teachers' availability, efforts to stay in contact, interest in students' learning, the quality of teacher-student relationships, encouragement to learn, and responsiveness to individual needs). Responses that were rated on a 4-point Likert scale ranging from 1 (Strongly agree) to 4 (Strongly disagree) were recoded so that higher scores indicate higher perceived support. School well-being information provision (Q23) covers the extent to which students received helpful information from their school or teachers related to well-being during the COVID-19 disruption. It includes four items covering topics such as personal safety, healthy eating, healthy working

habits (e.g., taking breaks), and maintaining physical fitness. Response options were: 1 (Yes, and it was helpful), 2 (Yes, but it was not helpful), and 3 (No), allowing differentiation between a mere provision of information and its perceived usefulness.

Environmental factors reflected changes in adolescents' lived experiences due to the COVID-19 pandemic. We included items from two question blocks: Home learning conditions during the pandemic (Q17) and Changes in learning aspects during the pandemic (Q18). The Home learning conditions assess the environment in which students engaged in learning at home during the COVID-19 disruption (access to a quiet study space, feelings of safety at home compared to school, responsibilities for caregiving, and availability of resources for schoolwork). Students responded using a 4-point frequency scale: 1 (Never or hardly ever), 2 (Sometimes), 3 (Most of the time), and 4 (Always). The Changes in learning aspects measured students' perceptions of how the pandemic affected their learning (perceived changes in the quality of schoolwork, level of distractions, and confidence in completing schoolwork). Each item was rated using a 3-point scale: 1 (Increased during the COVID-19 disruption), 2 (Did not change), and 3 (Decreased during the COVID-19 disruption).

2.2.4 Analysis

The scales were constructed using exploratory factor analysis (EFA) with principal axis factoring and equamax rotation with Kaiser normalization, on data including student sampling weights, using IBM SPSS Statistics 30. Based on eigenvalues greater than 1, and good interpretability of all factors, a three-factor solution was retained in the first scale (Q24), explaining 47.63% of the total variance (academic anxiety 18.41%, social well-being 14.97%, and COVID-19 anxiety 14.25%) and a two-factor solution for the second scale (Q25), accounting for 40.16% of the variance (emotional well-being 25.66% and physical engagement 14.50%). We interpreted the item loadings according to [Tabachnick and Fidell \(2006\)](#), suggesting cut-off values of 0.32 (poor), 0.45 (fair), 0.55 (good), 0.63 (very good) or 0.71 (excellent). Items were assigned to individual scales based on their factor loadings. After reviewing the content of the items, the majority of the items from Q24 and Q25 were reverse-coded so that higher scores corresponded to higher levels of agreement (1 - strongly disagree; 4 - strongly agree). Only the items covering emotional well-being stayed in their original format. Final scales were calculated by averaging responses to the included items, provided that at least half of the items had been completed. The R Analyzer for Large-Scale Assessments (RALSA; an R package for analyzing data from large-scale assessments that use complex sampling and assessment designs; [Mirazchiyski, 2021](#)) was used to identify the predictors of the well-being constructs using a linear regression procedure, which allows the appropriate use of sampling weights to properly estimate the standard error of the parameters in the population. The distribution of item responses is provided in [Table B3](#) in [Supplementary materials](#).

3 Results

First, a summary of the findings from the systematic review is provided, which includes an overview of various studies on the predictors of adolescent well-being during the COVID-19 pandemic, utilizing different methods and covering a wide range of ages, samples,

and geographical regions. Second, we identify several factors, including demographic, lifestyle, social, COVID-related, and health-related influences, that predicted adolescent well-being during school closures. Finally, the results of two multiple linear regression models for social and emotional well-being using the REDS data from a representative sample of students from Slovenia are presented.

3.1 Literature search results

An overview of the studies included in the systematic review ($N = 23$) that examined adolescent well-being during the COVID-19 pandemic is presented in [Table A1](#) in [Supplementary materials](#). The overview covers key aspects of the studies, including authors, study type and period, country of implementation, sample characteristics (size, gender distribution, and age), and well-being and other measured factors. Most of the studies are cross-sectional, although some use longitudinal designs. While the majority of studies focus on Europe, research from Asia (Iran, China, India, Israel, and Indonesia), North America (USA), and South America (Brazil) is also represented. The age range in the studies varies widely, with most studies focusing exclusively on adolescents, while some also include younger children (e.g., 5 to 10 years; [Nicoli et al., 2022](#)) and young adults (e.g., up to 24 years; [Berchtold, 2022](#)). Sample sizes also vary widely, ranging from only above a 100 (i.e., $N = 113$; [Wiguna et al., 2020](#)) to several 1,000 participants (i.e., $N = 17,740$; [Ma et al., 2021](#)). In addition, some studies specifically examine vulnerable groups, such as adolescents with pre-existing mental health conditions or chronic illnesses, in addition to the general adolescent population. Authors have employed various methods and tools to measure well-being, encompassing different aspects of an individual's life. The studies assessed adolescent well-being using specific well-being measures (e.g., WHO-5 Well-being Index, Warwick-Edinburgh Mental Well-Being Scale), as well as related concepts such as life satisfaction (e.g., Brief Multidimensional Students' Life Satisfaction Scale), daily affect (e.g., Positive and Negative Affect Scale for Children), emotional and behavioral problems (e.g., Strengths and Difficulties Questionnaire, Hospital Anxiety and Depression Scale, Brief Symptom Inventory-18), stress (e.g., Perceived Stress Scale), social well-being (e.g., UCLA Loneliness Scale) and others. These diverse tools highlight the multifaceted nature of addressing adolescent well-being during COVID-19 school closures.

3.1.1 Predictors of adolescents' well-being during COVID-19 school closures deduced from the systematic review

A systematic review identified several demographic, lifestyle, health-related, social, and COVID-19-related factors influencing adolescents' well-being during school closures (see [Table A2](#) in [Supplementary materials](#) for an overview).

3.1.1.1 Demographic factors

Age appeared to be a significant determinant of well-being, with younger adolescents generally reporting better well-being ([Calandri et al., 2022](#); [Cosma et al., 2021](#); [Ma et al., 2021](#); [Myhr et al., 2021](#); [Shoshani, 2023](#); [Szwarcwald et al., 2021](#); [Wright et al., 2021](#)). However, some studies indicated that older adolescents experienced greater well-being ([Berchtold, 2022](#); [Feng and Tong, 2023](#); [Kajka et al., 2023](#)), suggesting that the relationship may be context-dependent. Gender

differences were also evident, with male adolescents consistently reporting higher well-being than females (Berchtold, 2022; Calandri et al., 2022; Cosma et al., 2021; Di Norcia et al., 2023; Feng and Tong, 2023; Hoefnagels et al., 2022; Jusienė et al., 2022; Morres et al., 2021; Myhr et al., 2021; Pfetsch et al., 2022; Rawal et al., 2022; Shoshani, 2023; Szwarcwald et al., 2021; Thorisdottir et al., 2021; Wright et al., 2021). Socioeconomic status (SES) also played a crucial role, with lower SES being associated with poorer well-being (Myhr et al., 2021; Rawal et al., 2022; Szwarcwald et al., 2021; Wang et al., 2021). In addition, specific family characteristics, such as living in a single-parent household or belonging to a French-speaking community (compared to German-speaking), were linked to lower well-being (Berchtold, 2022).

3.1.1.2 Lifestyle factors

Leisure time emerged as a protective factor, with increased leisure activities contributing to higher well-being (Cosma et al., 2021; Di Norcia et al., 2023). The type of leisure also mattered, as socially active leisure, such as going out and meeting friends, was linked to better well-being, whereas idle activities, such as napping and photography, had a negative association with it (Cosma et al., 2021). Physical activity consistently showed a positive association with well-being, while sedentary behavior had a detrimental impact (Cosma et al., 2021; Di Norcia et al., 2023; Jusienė et al., 2022; Ma et al., 2021; Morres et al., 2021; Rawal et al., 2022; Szwarcwald et al., 2021; Wright et al., 2021). In addition, the frequency of physical activity (days per week) was a stronger predictor of well-being than its duration (minutes per week), with both in-house and out-of-house activity (stronger) being beneficial for it (Morres et al., 2021).

Diet was another influential factor, with healthy eating habits promoting better well-being (Morres et al., 2021; Szwarcwald et al., 2021). More specifically, unhealthy dietary patterns—such as frequent alcohol consumption, higher BMI (body mass index), almost daily intake of unhealthy foods, and insufficient consumption of fruits and vegetables—were associated with poorer well-being outcomes (Morres et al., 2021; Szwarcwald et al., 2021). Additionally, adolescents who maintained structured daily routines also reported better well-being (Shoshani, 2023), highlighting the importance of both nutrition and daily organization in supporting mental health.

Screen time has a complex relationship with well-being. Excessive solitary screen time predicted lower well-being (Cosma et al., 2021; Nicoli et al., 2022; Szwarcwald et al., 2021). However, video gaming was indirectly linked to improved well-being through emotional self-efficacy and positive coping mechanisms (Calandri et al., 2022). Moreover, online interactions that facilitated social contact with peers (e.g., time on social networks, online chatting, and social support seeking), contributed positively to well-being (Charmaraman et al., 2022; Di Norcia et al., 2023; Feng and Tong, 2023; Nicoli et al., 2022). Interestingly, adolescents who carried out cyberbullying and possessed a higher need to belong also reported better well-being in the context of contact restrictions and feelings of isolation, which the authors explain as their way of coming into contact with others and regulating loneliness maladaptively (Pfetsch et al., 2022).

3.1.1.3 General health factors

Mental health status was a critical determinant of well-being, with the absence of mental health problems being associated with better outcomes (Di Norcia et al., 2023; Jusienė et al., 2022; Kajka

et al., 2023; Ma et al., 2021). Additionally, anxiety in fathers was reported to have a strong negative influence on adolescents' psychological symptoms (Ma et al., 2021). Similarly, the presence of chronic health conditions (e.g., cystic fibrosis, kidney disease) was found to be a significant risk factor for poorer well-being (Hoefnagels et al., 2022). On another note, the ability to regulate one's emotions plays a pivotal role in shaping adolescent well-being. Limited emotion regulation strategies were linked to lower well-being (Pfetsch et al., 2022), whereas higher emotional self-efficacy was associated with better psychological outcomes (Calandri et al., 2022). Moreover, experiencing frequent unpleasant emotions negatively impacted well-being (Rawal et al., 2022), while greater resilience and the use of secondary control coping strategies emerged as protective factors, fostering more positive well-being outcomes (Asanjarani et al., 2023; Wang et al., 2021).

3.1.1.4 Social factors

Loneliness emerged as a significant risk factor for lower well-being (Asanjarani et al., 2023; Pfetsch et al., 2022; Szwarcwald et al., 2021). Conversely, social support and connectedness played a protective role (Feng and Tong, 2023; Shoshani, 2023). Higher levels of parental support were associated with better well-being (Asanjarani et al., 2023; Jusienė et al., 2022; Nicoli et al., 2022; Wang et al., 2021; Wiguna et al., 2020), as were strong peer relationships (Jusienė et al., 2022; Widnall et al., 2022; Wiguna et al., 2020). However, a heightened need to belong was linked to poorer well-being in times of school closures (Pfetsch et al., 2022). Support from schools also contributed positively to adolescent well-being (Jusienė et al., 2022; Widnall et al., 2022).

3.1.1.5 COVID-19-related factors

Strict pandemic restrictions were associated with lower well-being (Hoefnagels et al., 2022; Kajka et al., 2023; Ma et al., 2021; Szwarcwald et al., 2021). Anxiety related to COVID-19 significantly impacted well-being, with higher anxiety levels predicting worse outcomes (Wang et al., 2021; Wiguna et al., 2020; Wright et al., 2021). Notably, adolescents whose mothers worked in medical fields reported better well-being (Ma et al., 2021), possibly due to increased perceived resilience or access to accurate health information. However, another study showed that excessive exposure to (both factual and false) health-related information negatively affected well-being (Wiguna et al., 2020). Experiences with COVID-19 infections—whether affecting adolescents, their parents, or their friends—were consistently linked to poorer well-being (Ma et al., 2021; Szwarcwald et al., 2021). Lastly, school disruptions negatively affected well-being, particularly when instructional methods were altered (Szwarcwald et al., 2021; Thorisdottir et al., 2021). However, school-disconnected students experienced improved well-being when they were out of school (Widnall et al., 2022).

The systematic review highlights a range of global risk and protective factors that shaped adolescent well-being during the COVID-19 pandemic. Despite differences in the duration of school closures and national contexts, common themes emerge. The findings underscore the importance of multidimensional approaches to supporting adolescent well-being in times of crisis. While the review provides valuable insights into generalizable trends, it also highlights

the need for context-specific strategies tailored to the unique challenges and resources of different regions.

3.2 Predictors of adolescents' well-being during COVID-19 school closures in Slovenia

Two regression models were done separately for social and emotional well-being (see Table 2). The regression model significantly predicted both social well-being, $R^2 = 0.44$, $SE = 0.02$, Wald $F(29, 46) = 49.42$, $p < 0.001$, and emotional well-being, $R^2 = 0.33$, $SE = 0.02$, Wald $F(29, 46) = 38.22$, $p < 0.001$, showing that the included predictors accounted for a substantial proportion of variance in students' well-being during the COVID-19 disruption. Due to the large number of predictors included in the regression analysis, the Bonferroni correction was applied to control for type I error by adjusting the significance level for multiple comparisons, calculated by dividing the alpha level by the number of tests performed ($\alpha_{\text{Bonf}} = \alpha/n$, resulting in $\alpha_{\text{Bonf}} = 0.002$).

Multiple regression analysis revealed several significant predictors of students' social well-being during the COVID-19 pandemic (see Table 2). Physical engagement ($\beta = 0.086$, $p < 0.001$) was positively associated with social well-being. Surprisingly, so were academic anxiety ($\beta = 0.281$, $p < 0.001$) and COVID-19 anxiety ($\beta = 0.231$, $p < 0.001$). Among teacher-related factors, greater availability ($\beta = 0.095$, $p < 0.001$) and interest in learning ($\beta = 0.083$, $p = 0.001$) were also positively linked to higher social well-being. On the other hand, receiving no information on personal safety from school ($\beta = -0.146$, $p < 0.001$) was associated with lower social well-being compared to those receiving helpful information. Similarly, not receiving information on healthy working habits ($\beta = -0.275$, $p < 0.001$) and physical fitness ($\beta = -0.218$, $p < 0.001$), or receiving unhelpful information about physical fitness ($\beta = -0.144$, $p = 0.001$), were linked to lower social well-being compared to ones receiving helpful information. Regarding home learning conditions, students who reported having a quiet space to study ($\beta = 0.062$, $p = 0.001$) reported higher social well-being, while those who felt safer at home than at school ($\beta = -0.118$, $p < 0.001$) reported lower social well-being. In terms of changes in learning, a decrease in schoolwork quality ($\beta = -0.247$, $p < 0.001$) was associated with lower social well-being compared to ones not reporting a change.

In the model predicting emotional well-being, fewer variables were statistically significant (see Table 2). Female students reported significantly lower emotional well-being compared to males ($\beta = 0.146$, $p < 0.001$). As expected, academic anxiety ($\beta = -0.379$, $p < 0.001$) and COVID-19 anxiety ($\beta = -0.110$, $p < 0.001$) were negatively associated with emotional well-being. Surprisingly, so was physical engagement ($\beta = -0.124$, $p < 0.001$). Among school well-being information variables, not receiving information on healthy eating was associated with higher emotional well-being ($\beta = 0.170$, $p = 0.001$). Regarding changes in learning, both an increase ($\beta = 0.160$, $p = 0.002$) and a decrease ($\beta = 0.215$, $p = 0.001$) in the amount of distractions were associated with higher emotional well-being, while a decrease in confidence in completing schoolwork was negatively associated ($\beta = -0.290$, $p < 0.001$) with it, all compared to ones not reporting a change.

4 Discussion

Following the Bioecological Systems Theory (Bronfenbrenner, 2005), individual experiences are shaped by the dynamic interplay between personal characteristics and environmental factors. This synthesis underscores the complex and multifaceted nature of adolescent well-being, particularly in the context of the COVID-19 school closures, highlighting the significant role of individual, relational, and environmental determinants. While some findings from the systematic review remain inconclusive, such as those related to age and health information exposure, most predictors follow consistent patterns and are aligned with pre-pandemic (non-crisis) research. Complementing the findings from the systematic review, multiple regression analyses of REDS data from students in Slovenia identified several (same and new, compared to ones in the review) key predictors of students' social and emotional well-being during the COVID-19 pandemic. These predictors, which explain 44 and 33% of the variance in social and emotional well-being, respectively, can likewise be categorized into individual, social, and environmental domains.

At the individual level, the main predictors of adolescent well-being appear to function both similarly and differently in crisis and non-crisis situations. Before the pandemic, most studies reported a general decline in well-being across adolescence (González-Carrasco et al., 2017), reflecting developmental transitions and increasing psychosocial demands. However, evidence from developmental and longitudinal research suggests that well-being tends to decline in early adolescence but stabilise or even improve in late adolescence and early adulthood (Biermann et al., 2022; Yoon et al., 2023). During the pandemic, although overall well-being declined across age groups, this developmental pattern largely persisted (Calandri et al., 2022; Cosma et al., 2021; Ma et al., 2021; Shoshani, 2023; Yoon et al., 2023). Some studies, however, reported greater variability, with younger adolescents sometimes showing sharper declines (Berchtold, 2022; Feng and Tong, 2023). These findings suggest that age-related differences in well-being reflect both normative developmental processes and the ways in which crises can differentially impact or amplify these differences, depending on how strongly younger and older adolescents are affected by disruptions (e.g., in peer contact, daily routines). Gender differences were consistent across all contexts (including Slovenia), with adolescent girls reporting lower well-being than boys (Berchtold, 2022; Calandri et al., 2022; Hoefnagels et al., 2022; Wright et al., 2021). This aligns with pre-pandemic findings (González-Carrasco et al., 2017; WHO—World Health Organization, 2020) and suggests that the gender gap is structurally robust rather than crisis-specific. This gender gap likely reflects social and psychological factors such as stronger emotional reactivity and higher social and academic expectations among girls, and broader sociocultural norms that shape how adolescents experience and report their well-being (Rose and Rudolph, 2006), which may become even more pronounced in crisis situations. Socioeconomic disparities in well-being were evident both before (Nagy-Pénzes et al., 2020; WHO—World Health Organization, 2020) and during the pandemic (Myhr et al., 2021; Rawal et al., 2022; Szwarcwald et al., 2021; Wang et al., 2021). This pre-existing vulnerability likely intensified during the COVID-19 pandemic, as adolescents from lower socioeconomic backgrounds faced additional stressors, including limited access to digital resources, reduced learning support, and less stable home environments during school

TABLE 2 Predictors of social and emotional well-being during the COVID-19 pandemic.

Predictor	Social well-being				Emotional well-being			
	β	SE	t	p	β	SE	t	p
Gender ^b	0.019	0.034	0.571	0.568	0.146***	0.042	3.495	0.000
SES	0.019	0.017	1.131	0.258	0.032	0.017	1.857	0.063
Academic anxiety	0.281***	0.027	10.524	0.000	-0.379***	0.030	-12.810	0.000
COVID-19 anxiety	0.231***	0.025	9.294	0.000	-0.110***	0.026	-4.250	0.000
Physical engagement	0.086***	0.018	4.831	0.000	-0.124***	0.024	-5.155	0.000
Teacher support								
Availability	0.095***	0.022	4.240	0.000	0.029	0.028	0.998	0.318
Effort to keep in contact	0.065* ^a	0.026	2.479	0.013	-0.002	0.024	-0.087	0.930
Interest in my learning	0.083**	0.024	3.435	0.001	0.037	0.025	1.528	0.127
Good relationship	0.002	0.024	0.091	0.927	-0.023	0.025	-0.912	0.362
Encouraged to learn	0.063* ^a	0.024	2.602	0.009	-0.014	0.021	-0.674	0.500
Adaptations to individual needs	-0.017	0.024	-0.722	0.470	-0.079* ^a	0.027	-2.928	0.003
School information on well-being^c								
Personal safety—Not helpful	-0.110* ^a	0.052	-2.114	0.035	-0.149* ^a	0.060	-2.474	0.013
Personal safety—None	-0.146***	0.037	-3.982	0.000	-0.132* ^a	0.056	-2.362	0.018
Healthy eating—Not helpful	-0.029	0.059	-0.484	0.628	0.088	0.056	1.586	0.113
Healthy eating—None	0.012	0.052	0.233	0.816	0.170**	0.053	3.212	0.001
Healthy working habits—Not helpful	-0.085	0.050	-1.717	0.086	-0.035	0.050	-0.691	0.490
Healthy working habits—None	-0.275***	0.048	-5.784	0.000	-0.023	0.049	-0.471	0.638
Physical fitness—Not helpful	-0.144**	0.042	-3.407	0.001	-0.082	0.048	-1.708	0.088
Physical fitness—None	-0.218***	0.053	-4.127	0.000	-0.098* ^a	0.048	-2.035	0.042
Home learning conditions (pandemic)								
Quiet space at home	0.062**	0.018	3.447	0.001	0.050* ^a	0.022	2.233	0.026
Felt safer at home	-0.118***	0.017	-6.908	0.000	-0.039* ^a	0.019	-2.102	0.036
Looked after relative	-0.027	0.021	-1.264	0.207	-0.055* ^a	0.024	-2.327	0.020
Lacked needed things	-0.045* ^a	0.020	-2.230	0.026	-0.064***	0.023	-2.798	0.005
Changes in learning (pandemic)^d								
Schoolwork quality ↑	-0.092* ^a	0.043	-2.123	0.034	0.003	0.048	0.054	0.957
Schoolwork quality ↓	-0.247***	0.059	-4.190	0.000	-0.004	0.064	-0.063	0.950
Distractions amount ↑	0.011	0.040	0.286	0.775	0.160**	0.051	3.114	0.002
Distractions amount ↓	-0.050	0.043	-1.165	0.244	0.215**	0.062	3.448	0.001
Confidence in completing ↑	0.030	0.036	0.827	0.408	0.011	0.051	0.222	0.825

(Continued)

TABLE 2 (Continued)

Predictor	Social well-being				Emotional well-being			
	β	SE	t	p	β	SE	t	p
Confidence in completing ↓	−0.127* ^a	0.057	−2.222	0.026	−0.290***	0.068	−4.282	0.000

The statistical significance is indicated in **bold**.

^aCoefficient is not significant according to the Bonferroni procedure ($\alpha = 0.002$).

^bGirl = 1, boy = 2.

^cReference group: Yes, and it was helpful.

^dReference group: Did not change during the COVID-19 disruption.

SES = socioeconomic status scale (SES_irT); ↑ = increase; ↓ = decrease.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

closures (OECD, 2021). In the Slovenian REDS sample, SES showed a positive but non-significant association with well-being, likely due to limited variability in the sample design. Mental health challenges consistently emerged as major risk factors for lower well-being, both before the pandemic (Berkman and Glass, 2000; Steinberg, 2014) and during it (Di Norcia et al., 2023; Jusienė et al., 2022; Kajka et al., 2023; Ma et al., 2021). During the pandemic, a “new” anxiety appeared (i.e., COVID-19 anxiety), and the nature of anxiety’s effects appeared more complex. In Slovenia, both academic and COVID-19-related anxiety were positively associated with social well-being but negatively with emotional well-being. One possible explanation for this counterintuitive finding is that shared experiences of anxiety during the pandemic (particularly during school closures) may have fostered a sense of connection among students. The commonality of these stressors might have strengthened peer bonds and promoted mutual understanding, thereby enhancing students’ perceived social well-being despite elevated levels of anxiety. Conversely, both anxieties negatively predicted emotional well-being, suggesting that students experiencing higher anxiety in these areas tended to report higher social well-being and lower emotional well-being. Therefore, while this “shared anxiety” may have fostered a sense of social connectedness, it simultaneously took a toll on students’ internal emotional states, highlighting the complex and sometimes divergent ways in which anxiety can impact different aspects of well-being. This “shared anxiety” effect highlights that crisis-specific stressors may simultaneously harm emotional well-being while strengthening social connectedness.

By contrast, the self-regulatory abilities of adolescents have repeatedly been identified as a protective factor, supporting emotional resilience and mental health (Asanjarani et al., 2023; Calandri et al., 2022; Pfetsch et al., 2022; Wang et al., 2021). These findings are consistent with previous research emphasising the importance of emotional regulation and adaptive coping strategies in promoting adolescent well-being (e.g., Morrish et al., 2018). In crisis conditions, adaptive coping strategies and emotional regulation become especially salient, serving as buffers against stress and uncertainty (e.g., Cheng and Cheung, 2005). Both the amount of free time and how adolescents spend it are important for their well-being. Leisure activities that involve social interaction have consistently been identified as positive contributors, fostering connection and support among peers (Cosma et al., 2021; Di Norcia et al., 2023). During the pandemic, however, many leisure activities shifted toward digital spaces, where activities such as video gaming could also promote well-being, provided they supported emotional self-efficacy and adaptive coping strategies (Calandri et al., 2022). Physical health also plays a crucial role in adolescent well-being (e.g., Nagy-Pénzes et al., 2020). Our review

shows that engaging in health-promoting behaviors such as regular physical activity, reduced sedentary behavior, and a healthy diet has been consistently linked with higher well-being (Cosma et al., 2021; Di Norcia et al., 2023; Jusienė et al., 2022; Ma et al., 2021; Morres et al., 2021; Rawal et al., 2022; Szwarzwald et al., 2021; Wright et al., 2021). However, this relationship appears to have become more ambivalent during the pandemic in Slovenia. Slovenian data showed that physical engagement was negatively associated with emotional well-being, suggesting that higher levels of physical activity could be linked to poorer emotional outcomes, while simultaneously serving as a positive predictor of social well-being. This may reflect that during the pandemic, some students turned to physical activity as a coping strategy in response to emotional distress, rather than as a reflection of positive emotional states. At the same time, physical engagement positively predicted social well-being, possibly because such activities provided opportunities for social interaction, thereby supporting students’ social connectedness.

At a social level, the pandemic highlighted the crucial protective role of social connections. While social support has long been recognised as important for psychological well-being in non-crisis contexts (e.g., Berkman and Glass, 2000; Cohen, 2004; Holt-Lunstad et al., 2015; Layard, 2005; O’Toole and Simovska, 2022; Steinberg, 2014), the crisis context of the pandemic amplified its significance. Adolescents with stronger support from peers, parents and school consistently reported better well-being (Asanjarani et al., 2023; Feng and Tong, 2023; Jusienė et al., 2022; Nicoli et al., 2022; Shoshani, 2023; Wang et al., 2021; Widnall et al., 2022; Wiguna et al., 2020). This highlights that social support acts as a protective factor, mitigating the stress and uncertainty induced by the pandemic. Interestingly, cyberbullying was associated with better outcomes, but only among adolescents with a strong need to belong (Pfetsch et al., 2022). This could be attributed to the heightened loneliness experienced during the pandemic, which increases the craving for social connections (Hawkley and Cacioppo, 2010), including those that are inappropriate. This suggests that, in conditions of social deprivation, engagement with peers, even through negative interactions, may partially satisfy the psychological need for belonging. In Slovenia, social factors were stronger predictors of students’ social well-being than of emotional well-being. Support from teachers only played a significant role in predicting social well-being, with students who perceived their teachers as more available and interested in their learning tending to report higher levels. This indicates that perceived care and responsiveness from adults contribute to a sense of connectedness. School-level resources, particularly well-being-related information, contributed mainly to social functioning, showing that practical, actionable support is particularly beneficial in crisis contexts.

Receiving unhelpful or no information was associated with lower social well-being, highlighting the importance of relevance and quality in school communication. Notably, in non-crisis situations, the same forms of support may have less pronounced effects, as adolescents' social needs are more easily met through everyday interactions outside of school or family structures.

On another note, loneliness became more prevalent during the pandemic than in non-crisis periods (Entringer and Gosling, 2022) and is continuing to be a key factor linked to lower well-being (Asanjarani et al., 2023; Pfetsch et al., 2022; Szwarcwald et al., 2021). Similarly, excessive solitary screen time was detrimental (Cosma et al., 2021; Nicoli et al., 2022; Szwarcwald et al., 2021), highlighting that digital engagement alone, without meaningful interaction, may be insufficient to meet adolescents' social needs. This shows that the quality of social interaction, rather than mere connectivity, is important for maintaining adolescents' well-being. In Slovenia, the quality and relevance of school communication were important, emphasising the role of informational and instrumental support in promoting well-being. Students who received helpful information on personal safety, study habits or physical activity reported higher social well-being, whereas those who received unhelpful information or none at all scored lower. However, students who received no information on healthy eating reported higher emotional well-being, suggesting that the content or delivery of such information may not have resonated positively with students. Overall, these findings highlight that social and informational support are context-dependent. During crises, adolescents' needs may diverge from assumptions based on non-crisis contexts, as social deprivation and disrupted routines amplify the importance of meaningful interactions and practical guidance, whereas in stable periods, everyday interactions and existing structures may be sufficient to meet these needs.

At the macro level, the broader environment exerts a substantial influence on adolescent well-being, and this impact becomes particularly pronounced during global crises. Studies conducted during the pandemic consistently show that government-imposed measures, such as isolation, mobility restrictions, and school closures, contributed to increased mental health challenges among adolescents (Eurofound, 2021; Maggu et al., 2023; Mansfield et al., 2021; Raccanello et al., 2023). Self-Determination Theory (Ryan and Deci, 2017) provides a useful framework for understanding these effects, as unmet basic psychological needs for autonomy, competence, and relatedness can lead to reduced well-being. In line with this, stricter pandemic restrictions were strongly associated with poorer well-being (Hoefnagels et al., 2022; Kajka et al., 2023; Ma et al., 2021; Szwarcwald et al., 2021). In our review, stricter pandemic restrictions were strongly linked to poorer well-being (Hoefnagels et al., 2022; Kajka et al., 2023; Ma et al., 2021; Szwarcwald et al., 2021). School disruptions generally lowered well-being (Szwarcwald et al., 2021; Thorisdottir et al., 2021), though the effects were not uniform. Some students who had previously felt disconnected from school reported improved well-being during remote learning (Widnall et al., 2022), suggesting that traditional school environments may have been stressful for certain individuals, whereas remote learning offered greater autonomy and psychological safety. Poorer well-being was also linked to both perceived threats (e.g., COVID-19-related anxiety; Wang et al., 2021; Wiguna et al., 2020; Wright et al., 2021) and actual threats (e.g., direct exposure to infection: self, family, or friends; Ma et al., 2021; Szwarcwald et al., 2021) associated with the pandemic. Furthermore,

overexposure to both factual and false information (Wiguna et al., 2020) further contributed to heightened psychological distress. The overwhelming flow of both accurate and misleading information likely amplified uncertainty and fear, eroding adolescents' sense of control and trust. Conversely, adolescents whose mothers worked in the medical field exhibited better well-being (Ma et al., 2021), possibly due to having access to more reliable health-related knowledge and reassurance during the pandemic. In the Slovenian data, students who felt safer at home than at school reported lower levels of social well-being, which may reflect a lack of positive experiences or support at school. A decline in confidence and perceived quality of schoolwork was linked to lower emotional and social well-being, respectively. This highlights the importance of maintaining academic self-efficacy and engagement with school and peer interactions during crisis periods. These findings highlight the importance of the school environment as not only a learning space but also a key setting for fostering a sense of social belonging.

The study synthesizes evidence from diverse sources to provide an integrated overview of the key factors shaping adolescent well-being during an unprecedented global crisis. The pandemic underscored the interplay of individual, social, and environmental predictors, emphasizing the need for targeted, context-sensitive interventions. By combining a systematic review with an in-depth analysis of Slovenian data, this study offers both a global and locally grounded perspective. While the review identifies globally consistent risk and protective factors, the Slovenian case study highlights how these factors are shaped by national and cultural context. This dual approach ensures that recommendations for future crisis preparedness and response in primary schools are both evidence-based and locally grounded, thus merging universal insights with context-specific realities and needs.

While the same (or similar) predictors operate in all contexts (Slovenia and beyond) and both crisis and non-crisis conditions, their relative importance and mechanisms of action differ. In stable contexts, well-being is shaped primarily by normative developmental processes, everyday social interactions, and consistent access to support from family, peers, and schools. However, during crises such as the global pandemic, these dynamics shift as protective factors become more important while risk factors intensify. Crisis contexts amplify existing inequalities (e.g., SES, gender), alter the emotional meaning of protective behaviors (e.g., physical activity, peer interaction), and heighten the relevance of adaptive coping and digital connectedness. Behaviors that typically promote well-being, such as physical activity or digital engagement, may have more complex, or even ambivalent, effects (i.e., as seen in the Slovenian data) depending on the availability of social connection and emotional regulation. Similarly, the school environment, which is usually a stable source of belonging and structure, can become a source of vulnerability when routines and face-to-face interactions are disrupted. Additionally, during crises, macro-level disruptions such as lockdowns, information overload, and school closures, place intense pressure on adolescents' basic psychological needs for autonomy, competence, and relatedness, making high-quality social and informational support especially critical. While these supports remain important in non-crisis periods, they are less likely to be the primary drivers of well-being, as everyday routines, peer interactions, and institutional structures can more readily fulfil adolescents' needs. Yet, as both the systematic review and the Slovenian findings show, not all adolescents were affected equally. For some, crisis conditions can alleviate pre-existing stressors, such as

social anxiety or peer conflict, by offering new forms of autonomy or safety. For others, however, they can exacerbate vulnerabilities by intensifying loneliness, academic disengagement or exposure to family stress. Overall, these findings suggest that predictors of adolescent well-being are highly context-sensitive and can either enable or constrain the fulfilment of psychological needs. During crises, meaningful interactions, practical guidance, and responsive school and family support become critical, whereas in stable periods, everyday social connections and existing structures may suffice to meet adolescents' needs. Understanding these contextual variations is essential for designing flexible, equitable, and responsive interventions that can effectively support adolescents in both ordinary and crisis conditions.

Our findings underscore the necessity of comprehensive, multidimensional interventions to support adolescent well-being during and beyond crisis periods. Furthermore, the inclusion of multiple domains ensures a holistic perspective on adolescent well-being. Future interventions should address these interconnected levels simultaneously, promoting not only individual resilience, but also systemic support to sustain adolescents' sense of competence, relatedness and autonomy in various contexts. The identification of consistent predictors strengthens the evidence base for interventions, while recognition of mixed findings highlights areas requiring further investigation. By identifying both risk and protective factors, the study contributes valuable knowledge for policymakers, educators, and mental health professionals seeking to design targeted interventions. Holistically addressing these influences is critical to mitigating adverse outcomes and fostering well-being in young populations. Future research should continue to explore these relationships to develop effective strategies for supporting adolescent well-being in the face of future societal disruptions.

Extending this perspective, recent research both confirms and extends earlier predictions about the long-term consequences of the COVID-19 pandemic on adolescent well-being, revealing persistent mental health difficulties and enduring effects on psychological, physical, social, and educational development (e.g., Haskell et al., 2025; Zupanič Mali et al., 2024), underscoring the ongoing importance of individual, social, and environmental influences on youth adjustment. Haskell et al. (2025) reported that while adolescents' mental health has slightly improved post-pandemic, it remains below pre-COVID-19 levels, with low parental support, excessive social media use, and poor academic performance linked to poorer outcomes. The pandemic disrupted educational systems worldwide, resulting in learning losses and widening achievement gaps, particularly among disadvantaged students, thereby exacerbating existing inequalities (e.g., Štremfel and Veldin, 2025; Weihs and Proyer, 2025). These ongoing challenges have placed additional strain on the academic workforce, with teachers facing heightened stress, burnout and increased demands to support students' mental health and learning recovery (Štremfel and Veldin, 2025). Therefore, sustained investment in school-based resources, teacher support, and targeted well-being initiatives is essential to mitigate the long-term impact of the pandemic on both students and educators.

4.1 Limitations

Despite providing valuable insights into the predictors of adolescent well-being during COVID-19 school closures, this study has several

limitations that should be considered. The systematic review includes heterogeneous study designs, differences in sample sizes and especially the measurement tools, making direct comparisons challenging and may contribute to inconsistencies in findings. Contextual and cultural differences across countries, such as variations in COVID-19 policies and restrictions, may also impact the generalizability of results from the literature review. The cross-sectional nature of the REDS data limits our ability to draw causal inferences between predictors and outcomes. Furthermore, some of the findings, such as the positive association between anxiety and social well-being, or the negative association between physical engagement and emotional well-being, require cautious interpretation and further investigation in other samples and designs. Future research would also benefit from employing validated and multidimensional scales to measure well-being constructs more precisely and consistently. Furthermore, reliance on self-reported data introduces potential reporting biases, including recall bias and social desirability effects, which could affect the accuracy of well-being (and other) assessments. The study also focuses primarily on quantitative data, potentially overlooking the depth of adolescents' lived experiences, which qualitative research could better capture. Lastly, some studies included in the review did not account for variables, such as pre-existing mental health conditions or family dynamics, which could have influenced well-being outcomes. Addressing these limitations in future research through longitudinal, culturally diverse, and mixed-method approaches would provide a more comprehensive understanding of adolescent well-being in crisis situations.

5 Conclusion

Our research examined which factors predicted students' well-being during COVID-19 school closures, combining evidence from a systematic review with national data from Slovenia. The systematic review identified several consistent protective and risk factors that influence adolescent well-being during COVID-19 school closures. Key protective factors included strong social support from peers, families, and schools, as well as individual resources such as self-regulation, effective coping strategies, and health-promoting behaviors (e.g., regular physical activity, a balanced diet, and limited screen time). In contrast, risk factors included being female, having a lower socioeconomic status, having mental health difficulties, being physically inactive, and experiencing social risks such as a lack of support and loneliness, as well as environmental stressors such as restrictive lockdown measures and exposure to the virus. These global patterns were largely reflected in the Slovenian data, where protective factors included social support from teachers, helpful school information and having a quiet study space at home, whereas risk factors included being female, experiencing low levels of social support, feeling safer at home than at school and having decreased confidence in one's schoolwork or perceiving a decline in its quality. However, a complex pattern can be seen for the academic and COVID-19-related anxiety, and physical engagement, all serving as protective factors for social well-being but risk factors for emotional well-being. Both regression models significantly predicted students' social and emotional well-being, explaining a substantial proportion of the variance (44 and 33%, respectively). Together, the two studies indicated that protective and risk factors during adolescence are structurally stable, yet sensitive to context. Their strength and importance shifted

under crisis conditions, highlighting the importance of support at all levels. Promoting well-being in schools, therefore, requires a holistic approach that fosters resilience, strengthens supportive relationships, and ensures equitable and safe learning environments.

Data availability statement

Publicly available datasets were analyzed in this study. This data can be found at: IEA's website: <https://www.iea.nl/data-tools/repository/reds>.

Ethics statement

Ethical approval was not required for the studies involving humans because of the use of publicly available anonymized secondary data, where no participant identity is available or known. The studies were conducted in accordance with the local legislation and institutional requirements. Written informed consent for participation was not required from the participants or the participants' legal guardians/next of kin in accordance with the national legislation and institutional requirements because of the use of publicly available anonymized secondary data, where no participant identity is available or known.

Author contributions

MV: Data curation, Validation, Resources, Writing – original draft, Methodology, Visualization, Writing – review & editing, Formal analysis, Conceptualization, Investigation. NP: Formal analysis, Writing – review & editing, Investigation.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

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