Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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Original article

Subjective Well-Being of Adolescents in Luxembourg, Germany, and Brazil During the COVID-19 Pandemic

Pascale M. J. Engel de Abreu, Ph.D. [a,*], Sascha Neumann, Ph.D. [a,b], Cyril Wealer, Ph.D. [a], Neander Abreu, Ph.D. [c], Elizeu Coutinho Macedo, Ph.D. [d], and Claudine Kirsch, Ph.D. [a]

[a] *Faculty of Humanities, Education and Social Sciences, University of Luxembourg, Esch-sur-Alzette, Luxembourg*
[b] *Faculty of Economics and Social Sciences, University of Tübingen, Tübingen, Baden-Württemberg, Germany*
[c] *Institute of Psychology, Federal University of Bahia (UFBA), Salvador, Bahia, Brazil*
[d] *Center for Biological and Health Sciences, Mackenzie Presbyterian University, São Paulo, São Paulo, Brazil*

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A B S T R A C T

Purpose: This study explores adolescent well-being during the first wave of the COVID-19 pandemic in two high-income countries from Europe and one middle-income country from South America. The aim is to investigate the correlates of different dimensions of subjective well-being in 10- to 16-year-olds from different cultural contexts.
Methods: An online, self-report questionnaire was completed by 1,613 adolescents in Luxembourg, Germany, and Brazil between May and July 2020. The outcome variables were measures of life satisfaction and emotional well-being during the COVID-19 pandemic. The study included a range of sociodemographic, interpersonal, and intrapersonal covariates. Data were analyzed using descriptive statistics and latent variable structural equational modeling.
Results: A two-factor model of subjective well-being, consisting of life satisfaction and emotional well-being latent constructs, fitted well with this sample data for Luxembourg, Germany, and Brazil. Results showed that gender, socioeconomic status, intrapersonal factors, quantity and type of schoolwork, and relationships with adults were important common predictors of individual differences in subjective well-being during COVID-19. Fear of illness emerged as the strongest correlate of emotional well-being across the three countries.
Conclusions: This study indicates that girls and adolescents from low-income homes may be especially vulnerable to negative secondary impacts of COVID-19 that can affect mental health. It identified several common correlates of subjective well-being in adolescents from different cultural settings, including factors that may be changeable, such as the following: the way adults listen to adolescents, schoolwork during distant learning, and fear of illness. Findings can inform the development of quality interventions for promoting the well-being of adolescents during a global pandemic.

IMPLICATIONS AND CONTRIBUTION

This study explores adolescents' perception on their well-being and contributes toward giving them a voice during the COVID-19 pandemic. Findings help to gain a greater understanding of the factors that relate to subjective well-being and suggest that girls and adolescents from low-income homes are especially vulnerable to negative indirect effects of COVID-19.

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* Address correspondence to: Pascale M.J. Engel de Abreu, Ph.D., Faculty of Humanities, Education and Social Sciences, University of Luxembourg, Maison des Sciences Humaines, 11, Porte des Sciences, L-4366 Esch-sur-Alzette, Luxembourg.
E-mail address: pascale.engel@uni.lu (P.M.J. Engel de Abreu).

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Countries have taken drastic measures to minimize social interactions as part of mitigation efforts to reduce transmission of the coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus 2. These measures often included the temporary closure of educational institutions and organized leisure time activities. This created a radical change in the daily lives of adolescents. As social relationships are critical to well-being [1,2], this may have consequences for their mental health [3,4]. Existing studies indicate that the COVID-19 global pandemic has, indeed, negative effects on adolescent mental health [5,6]. Most studies have, however, been conducted with older adolescents and little data currently exist that explore adolescents' subjective experiences during the COVID-19 pandemic [6–8]. Furthermore, most published studies are from North America or China [5,6,8,9].

Here we present empirical data on subjective well-being (SWB) in adolescents aged 10–16 from Luxembourg, Germany, and Brazil during the first wave of the COVID-19 pandemic. The governments of these countries took various "lockdown" measures and imposed restrictions to contain the spread of infections, including implementing nationwide school closures. There are considerable concerns about the indirect effects of school closures and other social distancing interventions on adolescents' well-being that are currently not well understood [9–12]. Findings indicate that well-being is not a unidimensional construct [13–15]. A common distinction is made between indicators of objective well-being (e.g., material resources) and SWB that reflect people's perspectives of the quality of their lives [16]. SWB has been conceptualized as a multidimensional construct, including both cognitive evaluations (like life satisfaction) and affective feelings [17].

This study explores SWB during the COVID-19 pandemic in three countries by asking adolescents directly. The major aim is to determine which factors predicted cognitive and affective components of SWB during a phase of the pandemic in which schools were closed and other social distancing measures, such as restricted interactions with friends and increased stay-at-home time, were imposed. A particular interest was to assess whether common predictors of SWB would emerge in adolescents from diverse geographical settings and cultural backgrounds. The study relies on an online survey that covered a range of countries. Data from Luxembourg, Germany, and Brazil are presented here because the sample sizes from these countries allowed for advanced multivariate analyses and the country contexts varied. Luxembourg and Germany are two neighboring high-income countries in Europe that share cultural characteristics. Brazil, in contrast, is a very large middle-income country in South America that experiences relatively high levels of income inequality [18]. It also ranks among the hardest-hit countries in the world in terms of COVID-related deaths. These three countries implemented schools' closures in mid-March 2020 together with other "lockdown" measures. Although in Luxembourg and Germany schools partially reopened in May 2020 (followed by national or local phases of closing and reopening), most schools remained closed in Brazil at least until the end of 2020, marking one of the longest periods of school closures in the country's history [19,20].

Exploring adolescent SBW and its predictors in Luxembourg, Germany, and Brazil in the first wave of COVID-19 offers a unique opportunity to extend the evidence base of the indirect effects of the global pandemic to different national contexts. The study findings may be used to inform policies and interventions aimed at improving adolescent well-being in the current or future pandemics.

Methods

The data were collected via an unrestricted and anonymous web-based survey using nonprobability sampling. The advertisement, together with the link to the questionnaire, was distributed through different channels including social media platforms (e.g., Facebook, Instagram, WhatsApp), traditional print and broadcast media, and virtual professional groups. It invited children and adolescents to take part in a research project that explores how social distancing and school closure were affecting their lives. Participants self-selected into the study. Informed consent was obtained from caretakers and participants.

The virtual questionnaire contained 68 questions, elaborated to explore distance learning practices and SWB during the pandemic in 6- to 16-year-olds. For the purpose of this study, a subset of questions in relation to SWB in adolescents from Luxembourg, Germany, and Brazil was analyzed. The questionnaire completion rate was 97.4% for Luxembourg, 96.8% for Germany, and 96.8% for Brazil. The study has received ethical approval by the University of Luxembourg Ethics Review Panel and complies with the European Union's General Data Protection Regulation.

Participants

The inclusion criteria were age (10–16 years) and country of residence (Luxembourg, Germany, Brazil). Of the 1,613 participants who fit these criteria, 15 (.93%) were excluded because of missing data (over 50% of values missing on the entire questionnaire) or speeding (questionnaire completion time below 7 minutes). Another 83 cases (5.15%) were removed because they lacked responses on more than half of the outcome measures. The final sample was composed of 1,515 adolescents between 10 and 16 years, from Luxembourg (n = 397), Germany (n = 456), and Brazil (n = 662). The mean chronological age of the entire sample was 12.8 years (standard deviation = 1.93 years) and 58% were girls. This study used several measures of socioeconomic status (SES), including the International Socio-Economic Index of Occupational Status (ISEI-08, [21]). The mean ISEI score of the sample was 68.83 (standard deviation = 17.95, range: 11–89). The ISEI index was also categorized based on tertiles and the distribution according to these ISEI categories was as follows: 10% low, 12% middle, 78% high. Participant's characteristics according to country are represented in Table 1 and are described in the Results section. Compared to the general population of adolescents in the respective countries, our samples were of higher SES, based on parental occupation and numbers of computers and books at home (see Appendix 1, in the supplementary section).

Procedure

The questionnaire was online from May 6, 2020 to July 14, 2020. Participants could complete it in the language of their choice among six possible versions. Instructions specified that adolescents should complete the questionnaire themselves but that they could seek help from a caretaker if needed.

Table 1
Demographic characteristics of study participants and descriptive statistics for predictor and outcome variables

Variables	Luxembourg	Germany	Brazil	Test of significance
	n (%)	n (%)	n (%)	χ^2
Gender (girls)[a]	233 (60)	241 (54)	381 (59)	$\chi^2(2, N = 1{,}489) = 3.60, p = .17$
Residence area (city or town)	150 (39)[1]	240 (57)[1]	590 (97)[1]	$\chi^2(2, N = 1{,}416) = 422.50, p < .001$
Dwelling (with outside area)	319 (80)[1]	384 (84)[2]	325 (49)[1,2]	$\chi^2(2, N = 1{,}512) = 188.58, p < .001$
Siblings (yes)	321 (81)[1]	365 (80)[2]	448 (68)[1,2]	$\chi^2(2, N = 1{,}511) = 33.32, p < .001$
Own bedroom (yes)	354 (89)[1]	420 (92)[2]	478 (72)[1,2]	$\chi^2(2, N = 1{,}514) = 89.61, p < .001$
Access to computer/tablet at home (yes)	386 (97)[1]	434 (95)[2]	409 (62)[1,2]	$\chi^2(2, N = 1{,}515) = 287.75, p < .001$
School status at the time of survey completion (fully closed)	191 (48)[1]	294 (65)[1]	655 (99)[1]	$\chi^2(2, N = 1{,}512) = 389.17, p < .001$
Illness (self or household member) due to the pandemic (yes)[a]	75 (19)[1]	56 (12)[1]	199 (30)[1]	$\chi^2(2, N = 1{,}515) = 52.73, p < .001$
Social class (based on HISEI)				$\chi^2(2, N = 1{,}204) = 463.47, p < .001$
Low	24 (7)[1]	19 (5)[1]	78 (16)[1]	
Middle	55 (17)	37 (9)	51 (11)	
High	251 (76)	346 (86)	343 (73)	
	Mean (SD)	Mean (SD)	Mean (SD)	*F*
Age[a]	12.75 (1.99)	12.71 (2.03)	12.84 (1.81)	$F(2, 1{,}512) = .73, p = .48$
Life satisfaction before the pandemic[a]	6.67 (1.10)[1]	6.65 (1.00)[2]	6.49 (1.10)[1,2]	$F(2, 1{,}512) = 4.63, p = .01$
School performance before the pandemic[a]	6.50 (.97)[1]	6.57 (.94)[2]	6.25 (1.00)[1,2]	$F(2, 1{,}512) = 17.51, p < .001$
Fear of becoming ill during the pandemic[a]	2.26 (.97)[1,2]	2.00 (.92)[1]	2.08 (.94)[2]	$F(2, 1{,}485) = 8.09, p < .001$
Satisfaction with freedom during the pandemic[a]	2.54 (1.04)[1]	2.62 (.98)[2]	1.91 (.94)[1,2]	$F(2, 1{,}465) = 84.32, p < .001$
Difficulty and quantity of schoolwork during the pandemic[a]	4.13 (1.53)[1]	4.05 (1.53)[2]	4.71 (1.54)[1,2]	$F(2, 1{,}478) = 30.26, p < .001$
Content of schoolwork during the pandemic[a]	4.69 (1.45)[1]	4.41 (1.48)[1,2]	4.58 (1.62)[2]	$F(2, 1{,}480) = 3.43, p = .03$
Leisure time before the pandemic[a]	3.41 (.92)[1]	3.53 (.84)[2]	3.13 (.96)[1,2]	$F(2, 1{,}508) = 28.37, p < .001$
Internet use before the pandemic[a]	1.95 (.89)[1]	1.68 (.90)[1]	2.36 (.80)[1]	$F(2, 1{,}501) = 127.37, p <. 001$
Screen time during the pandemic[a]	4.52 (1.52)[1]	4.41 (1.50)[2]	4.96 (1.57)[1,2]	$F(2, 1{,}508) = 28.32, p < .001$
Physical activities during the pandemic[a]	5.21 (1.70)[1]	5.57 (1.54)[1]	3.41 (1.51)[1]	$F(2, 1{,}504) = 305.19, p < .001$
Passive activities during the pandemic[a]	5.02 (1.51)[1]	5.23 (1.46)[2]	5.50 (1.60)[1,2]	$F(2, 1{,}505) = 12.98, p < .001$
Parental occupational status (HISEI)[a]	67.94 (16.32)[1]	72.58 (13.75)[1,2]	66.29 (21.37)[2]	$F(2, 1{,}201) = 14.21, p < .001$
Wealth possessions[a]	5.60 (2.09)[1]	4.38 (1.75)[1]	3.85 (2.07)[1]	$F(2, 1{,}511) = 99.02, p < .001$
Cultural possessions[a]	3.60 (1.89)[1]	4.46 (1.74)[1]	1.91 (1.81)[1]	$F(2, 1{,}512) = 288.32, p < .001$
Satisfaction with the way adults listen during the pandemic[a]	3.02 (.90)[1]	2.98 (.91)[2]	2.76 (.96)[1,2]	$F(2, 1{,}468) = 11.76, p < .001$
Contact with teachers during the pandemic[a]	2.98 (.96)[1]	2.22 (1.01)[1]	3.26 (1.04)[1]	$F(2, 1{,}476) = 141.43, p < .001$
Lengths of not attending school due to the pandemic[a]	8.36 (1.84)[1]	8.59 (2.13)[2]	9.95 (3.26)[1,2]	$F(2, 1{,}509) = 59.24, p < .001$
General life satisfaction during the pandemic[b]	2.74 (.81)[1]	2.58 (.74)[1]	2.28 (.78)[1]	$F(2, 1{,}512) = 47.97, p < .001$
Satisfaction with school life during the pandemic[b]	2.76 (.81)[1]	2.58 (.83)[1]	2.20 (.83)[1]	$F(2, 1{,}512) = 63.50, p < .001$
Satisfaction with health and safety during the pandemic[b]	6.68 (1.33)[1]	6.59 (1.44)[2]	6.02 (1.60)[1,2]	$F(2, 1{,}512) = 32.49, p < .001$
Negative effects during the pandemic[b]	8.28 (2.78)[1]	7.99 (2.66)[2]	9.25 (2.94)[1,2]	$F(2, 1{,}512) = 30.86, p < .001$
Worries during the pandemic[b]	7.15 (2.70)[1]	6.90 (2.49)[2]	8.76 (3.00)[1,2]	$F(2, 1{,}512) = 72.21, p < .001$

Note: HISEI score [21] of either caretaker or the only available caretaker's score (low: <37; middle: between 37 and 63; high: >63). Figures with the same superscript numbers are statistically different per post hoc tests with Bonferroni corrections.
HISEI = Highest International Socio-Economic Index; SD = standard deviation.
[a] Predictor variables.
[b] Outcome variables.

Instrument and indicators

The self-report questionnaire was available in Luxembourgish, German, Brazilian Portuguese, European Portuguese, French, and English. It was developed and piloted by a multilingual team at the University of Luxembourg, followed by backward translation procedures. It was based on validated surveys on children's SWB [22,23] and the Organisation for Economic Co-operation and Development Programme for International Student Assessment [24]. All questions were selected to be relevant to cross-national comparisons and thereafter revised by an expert group from the three countries. In order to keep the questionnaire short, it contained a number of single-item questions, which have been shown to lead to the same predictive validity as multi-item scales [25].

SWB during the pandemic was assessed with different items and scales, providing the respondents' cognitive and affective evaluations of their own lives. Five outcome variables were derived:

General life satisfaction during the pandemic was assessed with a single-item measure that asked respondents for their overall individual satisfaction with life along a four-point scale ranging from "very dissatisfied" (1) to "very satisfied" (4).

Satisfaction with school life during the pandemic was assessed with one question. Participants were asked to indicate how satisfied they were with distant learning along a four-point scale ranging from "very dissatisfied" (1) to "very satisfied" (4).

Satisfaction with health and safety during the pandemic was assessed with two items that were adapted from the "Personal Well-Being Index–school children" [22]. Respondents were asked to rate how happy they were with their health and their personal safety, on a four-point scale ranging from "very dissatisfied" (1) to "very satisfied" (4). Factor analysis showed that, for each country, a single factor accounted for over 66% of the variance and factor loadings were all above .60. A composite score (sum score) was computed and used in subsequent analyses.

Negative effects during the pandemic was assessed with a four-item scale, adapted from an international survey of children's well-being [23]. Participants were asked to rate the frequency with which they experienced specific feelings along a four-point scale ranging from "almost never" (1) to "very often" (4). Factor analysis indicated unidimensionality of the scale for

each country. Internal consistency of the scale was satisfactory with Cronbach's alphas of .68 for Luxembourg, .70 for Germany, and .72 for Brazil. A scale score was computed by summing the items.

Worries during the pandemic was explored with a four-item scale that was based on a qualitative pilot study with children during the pandemic. Respondents had to indicate the frequency with which different statements worried them, along a four-point scale ranging from "almost never" (1) to "very often" (4). Factor analyses showed that the four items loaded on a common factor for each country. The scale revealed acceptable internal consistencies with Cronbach's alpha of .71 for Luxembourg, .65 for Germany, and .68 for Brazil. A scale score was computed by summing the items.

The framework that guided the choice of domains to be included for the predictor variables was the multilevel approach developed for international comparative contexts by the United Nations Children's Fund [26]. Items from the following domains were devised: activities, relationships, resources, policies, and context. In total, 20 predictor variables that included categorical and continuous data were derived. The predictors together with the domains they conceptually tap into and the exact indicators are represented in Table 2. Predictor variables were specified as observed variables measured with single questions or computed by summing the scores across different questions. Principal component analysis was used to reduce the number of variables and determine which questions could be combined. Questions that did not include enough variability were excluded. Principal component analysis was applied within each country. Only items that led to a unidimensional factor solution composed of the same items in each country were used to create composite scores.

Data analysis

Before the analysis, missing data in multi-item outcome measures were replaced with the within-person subscale mean score. Analyses of variance were conducted to compare mean differences between countries on continuous variables. Chi-square difference tests were used to test for differences when evaluating categorical variables.

Data were analyzed separately by country, using latent variable structural equation modeling (SEM). These analyses were performed on the covariance structure using AMOS software version 26.0 [27] with a maximum likelihood estimation method. We combined both confirmatory aspects of SEM with an exploratory search for relevant predictors. In a first step, we explored the measurement model of the SWB outcome variables. We initially formulated SWB during the pandemic as a confirmatory factor analysis (CFA) model consisting of a single latent variable with four indicators. Based on previous research showing that life satisfaction and affective components of SWB are related but separable constructs [17], we contrasted the single-factor model with a two-factor solution. In this two-factor model, the three satisfaction measures relating to general life, school, and health and safety were specified to load on a common construct and the worries and negative effect measures were linked to a separate underlying factor. Goodness of fit for the estimated models was assessed by the chi-square (χ^2) statistic. As this test is sensitive to large samples, additional absolute fit indices were examined: the Comparative Fit Index and the Tucker–Lewis Index for which values of .95 or higher indicate adequate fit, and the Root Mean Square Error of Approximation where values of .08 or less indicate adequate fit [28].

In a second step, we included a structural component to the model by adding the predictors. A multiple indicators multiple causes model (MIMIC) approach [29] was adopted by including all predictors simultaneously.

Results

Descriptive statistics

Table 1 represents the descriptive statistics for all the variables used in our models as well as comparisons with significance tests between the study samples.

When examining the sociodemographic characteristics and other background variables, the analysis showed that the three country groups did not differ significantly in terms of gender distribution and age. There were, however, significant cross-country differences on the other reported variables. Participants from Luxembourg and Germany were more similar to each other on a number of demographic indicators than participants from Brazil. In contrast to their peers from Europe, participants from Brazil reported more frequently to come from cities, homes without an outside area and have no siblings, no access to a computer or a tablet, and no own bedroom. Significantly more participants from Brazil than from Luxembourg and Germany reported having been ill themselves or living with a person who had fallen ill due to COVID-19. Participants from Germany reported the fewest infections. The three groups differed significantly from each other on SES indicators. In terms of parental occupation (ISEI continuous score), the German sample presented significantly higher scores than the samples from Luxembourg and Brazil, which did not differ significantly from each other. Notably, the data on the categorical ISEI score showed that significantly more participants from Brazil fell into the lowest SES category (16%) compared to participants from Luxembourg (7%) and Germany (5%). On wealth and cultural possessions, the three groups differed significantly from each other with the sample from Brazil presenting the lowest scores in each case. For wealth possessions, the Luxembourg sample had the highest scores and for cultural possessions, the German sample had the highest scores.

On the SWB outcome variables, the data indicate that the three groups differed significantly from each other on the general life and school satisfaction indicators, with participants from Luxembourg presenting the highest scores and participants from Brazil the lowest. Adolescents from Luxembourg and Germany presented comparable scores on satisfaction with health and safety, negative affects, and worries during the pandemic. In contrast, adolescents from Brazil reported significantly lower levels of satisfaction with health and safety and presented higher scores on the negative effects and worry scales than their peers from Europe. These cross-country comparisons should be interpreted with caution, mostly because of the assumption of cultural comparability of the instrument (that has not been tested) as well as the culture response bias phenomenon known to affect responses on self-rating well-being and psychological scales [30].

Table 2
Predictors together with domains and indicators used in this study

Predictor variables	Domains (spheres[a])	Indicators
1. Age	Child level, individual	Chronological age in years
2. Gender	Child level, individual	Frequencies of boys and girls
3. Life satisfaction before the pandemic	Intrapersonal	Satisfaction rating for general life and school
4. School performance before the pandemic	Intrapersonal	Quality rating of school achievement and perceived difficulty of schoolwork
5. Fear of becoming ill during the pandemic	Intrapersonal	Frequency rating of fear of becoming ill of self or someone that the adolescent knows well
6. Satisfaction with freedom during the pandemic	Intrapersonal	Satisfaction rating for the freedom children have
7. Difficulty and quantity of schoolwork during the pandemic	Intrapersonal	Frequency of finding schoolwork too difficult and/or too much
8. Content of schoolwork during the pandemic	Intrapersonal	Frequency of finding schoolwork interesting and/or useful
9. Leisure time before the pandemic	Social activities before the pandemic (activities)	Frequency of attending a leisure facility and meeting friends outside school
10. Internet use before the pandemic	Digital activities before the pandemic (activities)	Duration of internet use on an average day
11. Screen time during the pandemic	Free time activities during the pandemic (activities)	Frequency of watching TV and/or playing videogames
12. Physical activities during the pandemic	Free time activities during the pandemic (activities)	Frequency of doing sports and/or outdoor activities
13. Passive activities during the pandemic	Free time activities during the pandemic (activities)	Frequency of listing to music and/or doing nothing
14. Parental occupation	Socioeconomic status (resources)	Highest International Socio-Economic Index of occupational status of either caretaker
15. Wealth possessions	Socioeconomic status (resources)	Number of TVs, cars, and/or tablets at home
16. Cultural possessions	Socioeconomic status (resources)	Number of books and/or musical instruments at home
17. Satisfaction with the way adults listen during the pandemic	Relationship with adults during the pandemic (relationships)	Satisfaction rating for the way adults generally listen to adolescents
18. Contact with teachers during the pandemic	Relationship with teachers/school (relationships)	Frequency of contact (including online) with teachers
19. Lengths of not attending school due to the pandemic	School policies (policies)	Number of weeks adolescents have not attended school owning to the pandemic
20. Illness due to the pandemic	Home health situation in relation to the pandemic (context)	Illness of self or household member due to the pandemic

[a] Based on the multilevel approach to well-being developed by United Nations Children's Fund [26].

Measurement models

The CFA of the hypothesized two-factor model of SWB demonstrated an acceptable fit to data for the three samples. This model is displayed in Figure 1. Following SEM graphing conventions, observed variables are represented by rectangles and latent constructs by ovals. Regression effects are denoted by single-headed arrows and double-headed arrows represent correlations.

As can be seen from the fit statistics in Table 3, the two-factor solution fitted well with this sample data for Luxembourg, Germany, and Brazil. In each case, the two-factor model represents a significant improvement from the one-factor model, as evidenced by chi-square tests of difference. All the paths from the latent factors (life satisfaction and emotional well-being) to their indicators were statistically significant ($p < .05$). All factor loadings were moderate to strong [28] and ranged between .43 and .81 for Luxembourg, .42 and .85 for Germany, and .45 and .76 for Brazil. As expected, the latent constructs were highly correlated, with correlation coefficients between .76 and .83 across the different country models.

Multiple indicators multiple causes models

Next, we fitted MIMIC models to the data, where the two latent factors identified in the previous CFAs were simultaneously regressed on the 20 predictors. In a first step, models included all the possible paths from the predictor variables to the latent outcome factors that were allowed to correlate. Subsequently, nonsignificant pathways were successively dropped to obtain simplified models in which all remaining paths were statistically significant. Table 4 represents the standardized regression parameters of these simplified MIMIC models for the different study samples together with the proportion of variance in the SWB outcome factors accounted for by the predictors in the model (R^2).

Nine significant predictors were common for the three countries: gender, life satisfaction before the pandemic, fear of illness, satisfaction with freedom, difficulty/quantity of schoolwork, content of schoolwork, passive activities, cultural possessions, and satisfaction with the way adults listen. Additionally, screen time was a significant predictor for the Luxembourg sample and leisure time before the pandemic, physical activities, and wealth possessions were significant predictors for the sample from Germany. Finally, age, leisure time before the pandemic, screen time, and wealth possessions were significant additional predictors for the sample from Brazil.

Discussion

Findings from this cross-sectional study with 10- to 16-year-olds during the first wave of the COVID-19 pandemic showed that an SWB model, composed of life satisfaction and emotional well-being latent constructs, fits well with the sample data for

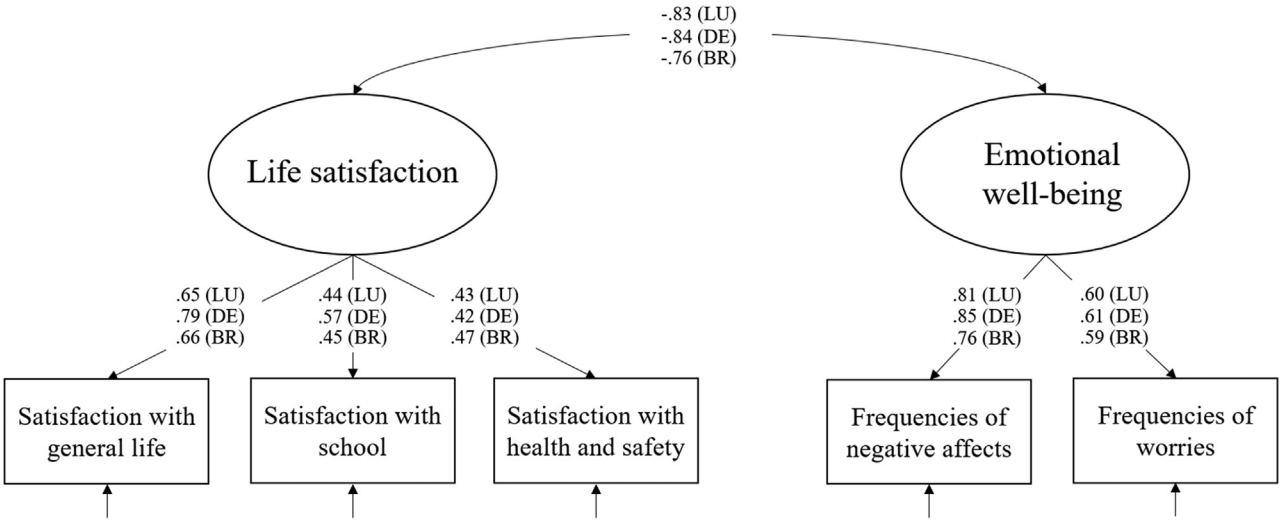

Figure 1. Two-factor CFA model with standardized coefficients (correlation and factor loadings) for subjective well-being during the COVID-19 pandemic in 10- to 16-year-olds from Luxembourg (LU), Germany (DE), and Brazil (BR).

Luxembourg, Germany, and Brazil. This result is compatible with other studies and confirms that SWB is a multidimensional construct composed of separable but intercorrelated factors in adolescents [13,17]. Despite between-sample differences in sociodemographic characteristics and perceived life satisfaction during the pandemic, the models showed that 9 of 20 investigated predictors emerged as common correlates of individual differences in SWB during the global pandemic in adolescents from 3 countries in Europe and South America. Lower levels of SWB during the pandemic were associated with being a girl, having fewer cultural possessions, and a lower life satisfaction before the pandemic. Furthermore, a number of factors during the pandemic emerged as significant common predictors of SWB, including fear of illness (self or other), difficulty and quantity of schoolwork, content of schoolwork, passive activities, satisfaction with freedom, and satisfaction with the way adults listen to adolescents. At the same time, other predictors, such as length of school closure, frequency of contact with teachers, or illness due to the virus appeared to be less predictive in the early phase of the global pandemic.

This study indicates that there are core similarities in the intrapersonal and interpersonal factors and influences at the microlevel and macrolevel that shape adolescents' well-being during the pandemic notwithstanding the different geographical and cultural contexts. The finding that girls and adolescents from low-income homes have a higher risk of suffering negative psychological consequences of COVID-19 than boys and adolescents from more affluent homes is consistent with other evidence suggesting that the indirect effects of COVID-19 are likely to fall disproportionally on some groups and exacerbate preexisting inequalities [7,11,31]. Another noteworthy finding relates to schoolwork during distant learning. The quantity, difficulty, and content of schoolwork emerged as important predictors of adolescent SWB across the three countries. It has been widely acknowledged that closing schools places a considerable burden on adolescents and caregivers. Currently, there is little evidence-based guidance for teachers on how to optimally support students during times of a pandemic [12,32]. Our findings indicate that the volume and type of schoolwork—known to shape student learning—also affect well-being. They are therefore important to consider when planning lessons during distance education. The fear of the virus itself was identified as another important predictor of adolescent well-being. These findings corroborate other studies which indicate that the fear that family, friends, or themselves might fall ill from the virus is a major reason for anxiety among adolescents [7]. It has been argued that these fears could have far-reaching effects and contribute toward the observed increase in the incidence of mood and anxiety disorders among adolescents associated with the COVID-19 pandemic [33]. Clinicians could explicitly explore and address those stressors as part of their biopsychosocial formulation. It might also be that early interventions that help adolescents to manage their fears could also improve their

Table 3
Fit statistics for the subjective well-being measurement models by country, with chi-square tests of difference

Models of subjective well-being	χ^2	df	*p*-value	CFI	TLI	RMSEA
Luxembourg						
Model 1: One-factor model	12.98	5	.02	.97	.95	.06
Model 2: Two-factor model	6.85	4	.14	.99	.98	.04
Germany						
Model 1: One-factor model	25.46	5	<.001	.96	.92	.10
Model 2: Two-factor model	12.76	4	.01	.98	.96	.07
Brazil						
Model 1: One-factor model	34.70	5	<.001	.94	.87	.10
Model 2: Two-factor model	15.58	4	.004	.98	.94	.07

Model 1–Model 2	$\Delta\chi^2$	Δdf	*p*-value
Luxembourg	6.13	1	.01
Germany	12.70	1	<.001
Brazil	19.12	1	<.001

Note: $\Delta\chi^2 = \chi^2$ test of model differences. Model 2 is represented in Figure 1.
CFI = Comparative Fit Index; RMSEA = Root Mean Square Error of Approximation; TLI = Tucker–Lewis Index.

Table 4
Standardized estimates between predictors and life satisfaction and emotional well-being constructs from MIMIC models for the different country samples

Predictor variables	Luxembourg		Germany		Brazil	
	LS	EW	LS	EW	LS	EW
1. Age	–	–	–	–	–	.13
2. Gender[a]	–	−.17	–	−.14	–	−.11
3. Life satisfaction before the pandemic	.17	−.28	–	−.10	.17	−.15
4. School performance before the pandemic	–	–	–	–	–	–
5. Fear of becoming ill during the pandemic	–	.40	–	.33	−.16	.42
6. Satisfaction with freedom during the pandemic	.42	−.25	.57	−.43	.44	−.27
7. Difficulty and quantity of schoolwork during the pandemic	−.19	.19	−.29	.18	−.22	.24
8. Content of schoolwork (interesting/useful) during the pandemic	.18	–	.17	–	.24	−.12
9. Leisure time before the pandemic	–	–	−.11	–	–	−.11
10. Internet use before the pandemic	–	–	–	–	–	–
11. Screen time during the pandemic	–	.13	–	–	.20	–
12. Physical activities during the pandemic	–	–	.09	–	–	–
13. Passive activities during the pandemic	−.16	.23	–	.25	–	.24
14. Parental occupation	–	–	–	–	–	–
15. Wealth possessions	–	–	–	.09	.32	–
16. Cultural possessions	.22	−.12	–	−.10	.19	.10
17. Satisfaction with the way adults listen during the pandemic	.34	−.17	.19	−.19	.25	−.16
18. Contact with teachers during the pandemic	–	–	–	–	–	–
19. Lengths of not attending school during the pandemic	–	–	–	–	–	–
20. Illness during the pandemic	–	–	–	–	–	–
R^2	.47	.47	.50	.47	.59	.48

Note: Nonsignificant pathways (–) were dropped from these models to obtain simplified models in which all paths were statistically significant. Higher scores on the emotional well-being component represent more frequent negative emotions; higher scores on the life satisfaction component represent a higher life satisfaction.
EW = emotional well-being; LS = life satisfaction; MIMIC = multiple indicators multipe causes models.
[a] Gender was coded as one for female and two for male.

overall well-being and mental health. Finally, the study showed that adolescents who reported that they were satisfied with the way adults listened to them during the pandemic were more likely to be satisfied with their life and report better emotional well-being. This indicates that relationships with adults play a prominent role in SWB during the pandemic. It appears to be very important to adolescents to be listened to and be involved in decision-making [9,26,34]. This might become particularly vital for well-being when adolescents are isolated from their peers and confined at home.

Strengths, limitations, and future directions

Two strengths of this study need highlighting: it investigated SWB as a multidimensional construct by using latent variables and explored the adolescents' own perspectives on their lives during the pandemic. To the best of our knowledge, this is the first study on SWB during the early stages of the COVID-19 pandemic that included adolescents as young as 10, across different sociocultural contexts.

Several limitations need to be acknowledged. Generalizability of the current results is limited by the reliance on self-selection sampling via online recruitment, which may be prone to selection bias. Only participants with access to technological devices (e.g., computer, tablet) and internet connection could participate. The majority of participants were of higher SES and not representative of the whole country populations. It has been suggested that the relationship of SES with well-being is stronger in poorer than in richer study samples [3,17]. It is therefore possible that our study underestimated associations between SES and well-being outcomes. Future research is needed to investigate SWB in adolescents from more socio-economically diverse samples and in adolescents growing up in poverty. As we used an open online questionnaire, we cannot fully rule out that some participants were not part of the target population or that family members completed the survey. Although the study explored 20 potential predictors of SWB during COVID-19, these should not be considered as exhaustive. Due to ethical considerations related to conducting data collection online with younger age groups in the early months of a global pandemic, we did not directly explore intrafamily relationships. The pandemic has profoundly affected family interactions (including homeschooling situations) which may have significantly affected adolescent mental health. Future studies should examine additional correlates of SWB including family support, and the quality of supervised homeschooling. Owing to the predictive limitations in cross-sectional correlational study designs, we cannot infer causal relationships among the examined variables. Further longitudinal research is needed to obtain a better indication of causality and explore possible long-term effects of the pandemic on adolescent mental health. This study took place during the first country lockdowns including school closures. Follow-on studies should explore whether predictive patterns might have changed over the longer term course of the pandemic, especially as the mitigation policies began to differ by country. It is possible that some of the predictors (i.e., length of school closure) that emerged as nonsignificant in our models, might have gained in importance during later waves of the pandemic, especially in situation of prolonged school closure (such as in Brazil).

Despite these limitations, the proposed models contribute to further our understanding of the indirect effects of COVID-19 on adolescent well-being and can inform the development of prevention interventions to help adolescents improve their SWB. This research provides an early multivariate insight into indirect

consequences of the pandemic on adolescent well-being. Further monitoring of adolescent well-being outcomes as well as determinants of well-being is clearly needed.

As the COVID-19 pandemic continues to evolve, it is important to adequately support and promote the well-being of adolescents. Interestingly, the results suggest that although there are country-specific differences, key predictors of adolescent well-being were surprisingly similar. Such commonality indicates areas that may be prioritized in global response plans in the current or future pandemics. Notably, this study indicates certain common risk and protective factors that may affect adolescents' well-being during the pandemic. Some of these, namely the way that adults listen to adolescents, schoolwork during distant learning, and fear of illness, may have greater scope for change than others. Such timely information may inform quality intervention development both for the duration of the current pandemic and for future similar events [35].

This study contributes toward raising awareness of the significant impact of the pandemic on the well-being of girls and adolescents of lower SES. This should be recognized when planning and implementing measures to tackle COVID-19. Finally, the study is in line with the United Nation's Convention on the Rights of the Child [36] in that it incorporates adolescent's views. Decision makers should consider these perspectives when taking decisions about issues that concern adolescents during the global pandemic.

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Supplementary Data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.jadohealth.2021.04.028.

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