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Child and Adolescent Mental Health During the COVID-19 Pandemic: Results of the Three-Wave Longitudinal COPSY Study

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A B S T R A C T

Purpose: The German population-based longitudinal **CO**VID-19 and **Psy**chological Health study monitors changes in health-related quality of life (HRQoL) and mental health of children and adolescents during the COVID-19 pandemic and identifies vulnerable groups.
Methods: A nationwide, population-based survey was conducted in May 2020 to June 2020 (Wave 1), December 2020 to January 2021 (Wave 2), and September 2021 to October 2021 (Wave 3). In total, n = 2,097 children and adolescents aged 7–17 years were investigated using measures to assess HRQoL (KIDSCREEN-10), mental health problems (SDQ), anxiety (SCARED), depressive symptoms(PHQ-2), and psychosomatic complaints(HBSC-SCL).
Results: The prevalence of low HRQoL increased from 15% prepandemic to 40% and 48% in Waves 1 and 2 and improved slightly to 35% in Wave 3 (all differences significant). Similarly, overall mental health problems increased from 18% prepandemic to 29% in Wave 1 and 31% in Wave 2 to 28% in Wave 3 (all differences significant, except Wave 3 vs. 2), anxiety increased from 15% prepandemic to 24% and 30% in Waves 1 and 2 and was still 27% in Wave 3. Depressive symptoms increased from 10% prepandemic to 11% and 15% in Waves 1 and 2 and were 11% in Wave 3. A group with low parental education, restricted living conditions, migration background, and parental mental health problems was at significantly increased risk of HRQoL and mental health impairments.
Discussion: The prevalence of low HRQoL, mental health problems, and anxiety has been elevated throughout the pandemic. Thus, mental health promotion, prevention, and intervention strategies need to be implemented to support adolescents—particularly those at risk.
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IMPLICATIONS AND CONTRIBUTION

As one of the first longitudinal population-based studies during the COVID-19 pandemic, the COPSY study reports a decline in mental health and health-related quality of life in the first year of the pandemic, followed by a slight improvement in autumn 2021, although the deterioration remains high compared to prepandemic data.

More than two years have passed since the COVID-19 pandemic started, fundamentally affecting young people worldwide. Fortunately, most children and adolescents display only mild acute symptoms of COVID-19 [1,2]. Yet, it is still unclear to what extent long COVID, a blanket term used for persistent symptoms following a COVID-19 infection characterized by fatigue, breathlessness, concentration problems, and depression, affects the youth. Prevalence rates reported in reviews are highly variable, but reach values up to 66% [3,4]. In addition to the physical impact of COVID-19, the pandemic poses many challenges to mental health.

Many studies report that for the majority of children and adolescents it was most challenging that social contacts were restricted [5−7], homeschooling was strenuous [8−11], and the youth felt burdened by restrictions of their leisure activities [8]. Furthermore, studies show that physical activity decreased, while screen time [12], eating, and weight increased [13−15]. Experts also warn and empirical evidence demonstrates that maltreatment and violence against children and adolescents increased during the pandemic [16,17].

Reviews of cross-sectional studies [18−20] and a growing body of longitudinal studies indicate that health-related quality of life (HRQoL) of children and adolescents significantly decreased during the pandemic [7,21,22] and that mental health problems increased [21,23−31]. Reviews describe an average doubling of symptoms of anxiety (21%) and depression (25%) [20] and high prevalences of depression (29%), anxiety (26%), sleep disorders (44%), and post-traumatic stress symptoms (48%) [18]. However, some studies report mixed results [32−34] or no difference between prepandemic and pandemic data [35,36]. Longitudinal studies covering both the prepandemic period and long periods during the pandemic are needed to substantiate and differentiate our growing knowledge about the effects of the pandemic on the mental health of children and adolescents [37,38].

The German **CO**VID-19 and **Psy**chological Health (COPSY) study is one of the first population-based longitudinal studies to monitor HRQoL and mental health in children and adolescents during the COVID-19 pandemic, covering three waves of data collection so far and having the advantage of prepandemic population-based data being available for comparison (*Behaviour and Well-being of Children and Adolescents in Germany* [BELLA] study [39] and *Health Behaviour in School-aged Children* [HBSC] study [40]). The aim of this study is to examine the course of mental health and HRQoL in children and adolescents during the pandemic. We also aim to identify groups vulnerable to deteriorating mental health and HRQoL. The following research questions are to be answered:

(1) How did child and adolescent HRQoL and mental health change during Waves 1 to 3 of the COPSY study and compared with prepandemic data? We expected an increase in the prevalence of low HRQoL and mental health problems from prepandemic data to Wave 1 due to lockdown measures and restrictions, a slight increase between Wave 1 and Wave 2 due to ongoing restrictions, and improvements from Wave 2 to Wave 3 due to low infection rates, vaccination, and a loosening of restrictions in summer/autumn 2021.
(2) Are (theoretically and empirically derived) risk factors associated with lower HRQoL and mental health during the

pandemic? We expected a certain constellation of socioeconomic and psychosocial factors to be associated with lower HRQoL and mental health in children and adolescents across the different phases of the pandemic.

Methods

Study design and sample

The COPSY study is a population-based longitudinal study on child and adolescent mental health during the COVID-19 pandemic in Germany. The survey was conducted in three waves. Wave 1 (May 2020 to June 2020) took place when Germany was under a partial lockdown, with schools and leisure facilities mostly closed. Wave 2 (December 2020 to January 2021) was conducted while the second wave of the pandemic was ongoing and the country was under a nationwide lockdown. Wave 3 (September 2021 to October 2021) was undertaken after a summer with low infection rates and which led to countrywide restrictions being loosened. To ensure that the sample reflected the sociodemographic characteristics of the German population, families were recruited from an online panel using quota sampling. Participating families were reinvited at each follow-up of the COPSY study and new families were recruited to compensate for dropouts, ensuring sociodemographic representativeness and comparability across all three waves. Parent-reported data were collected from children and adolescents aged 7−17 years, and additionally self-reported data were gathered from children and adolescents aged 11−17 years. Finally, n = 2,097 families participated in at least one measuring point of the COPSY study, including n = 1,531 self-reports for 11−17 year olds and n = 2,097 parent-reports for 7−17 year olds. For an overview of the COPSY sample, see Figure 1.

In Wave 1, n = 1,040 self-reports and n = 1,586 parent-reports provided data; in Wave 2, n = 1,077 self-reports and n = 1,625 parent-reports provided data with a retention rate from Wave 1 to Wave 2 of 85%. The design and findings of the first two waves have been described elsewhere [3,31]. In Wave 3, n = 1,139 self-reports and n = 1,618 parent-reports provided data (see Figure 1).

In total, n = 806 families participated in all three waves of the study with a longitudinal participation rate of 77.5%. Parents participating in all three waves were on average 2.3 years older (d = 0.31) and were more likely to have a lower level of education (20.5% vs. 15.2%; V = 0.07) compared with those who only participated in one or two waves. No other significant differences in sociodemographic or mental health-related variables were found. The data sets from all three waves of the COPSY study were each weighted to correspond to the sociodemographic characteristics of the German population (according to the 2018 Microcensus). The COPSY study was approved by the Local Psychological Ethics Committee (LPEK-0151) and the Commissioner for Data Protection of the University of Hamburg.

Prepandemic German population-based data were used for comparison [39] from the longitudinal BELLA study, conducted between 2014 and 2017 providing data of n = 1,020 participants (aged 11−17 years) on mental health and HRQoL; the German HBSC study [40] conducted between 2017 and 2018 provides data on psychosomatic complaints of n = 1,073 participants (aged 11, 13, and 15 years).
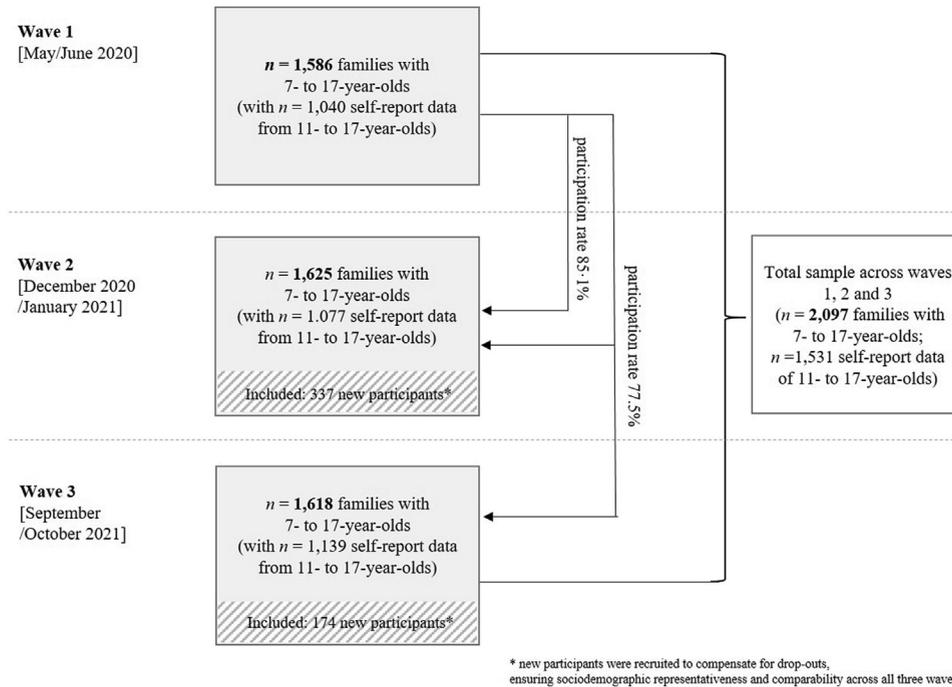
Wave 1
[May/June 2020]

$n = \mathbf{1,586}$ families with
7- to 17-year-olds
(with $n = 1,040$ self-report data
from 11- to 17-year-olds)

Wave 2
[December 2020
/January 2021]

$n = \mathbf{1,625}$ families with
7- to 17-year-olds
(with $n = 1.077$ self-report data
from 11- to 17-year-olds)

Included: 337 new participants*

Wave 3
[September
/October 2021]

$n = \mathbf{1,618}$ families with
7- to 17-year-olds
(with $n = 1,139$ self-report data
from 11- to 17-year-olds)

Included: 174 new participants*

participation rate 85·1%

participation rate 77.5%

Total sample across waves
1, 2 and 3
($n = \mathbf{2,097}$ families with
7- to 17-year-olds;
$n = 1,531$ self-report data
of 11- to 17-year-olds)

* new participants were recruited to compensate for drop-outs,
ensuring sociodemographic representativeness and comparability across all three waves

Figure 1. Numbers of participating families and children in Wave 1, Wave 2, and Wave 3 of the COPSY study.

Measures

Sociodemographics. The survey included questions on age, gender, education, living space, and migration background.

COVID-19 burden. The survey contained a question as to whether there had been a COVID-19 infection in the family, whether the adolescent had been infected, whether a family member had died of COVID-19, and two self-developed questions asked about the perceived burden of the pandemic [5].

Quality of life and mental health in children and adolescents. Internationally established and validated questionnaires were administered. HRQoL was assessed using the self-reported KIDSCREEN-10 Index [41,42]. Children and adolescents were classified as having low, normal, or high HRQoL using reference data from the national BELLA study (normal HRQoL was defined as $M_{BELLA}+/-1SD_{BELLA}$). The Strengths and Difficulties Questionnaire (SDQ) [43] provides a total difficulties score across 20 items and four subscale scores on emotional problems, conduct problems, hyperactivity, and peer problems. Higher scores indicate more severe problems. Cutoffs served to differentiate between participants *with* versus *without* mental health problems (*noticeable/abnormal* and *borderline* vs. *normal)* [44]. Anxiety was assessed using the general anxiety subscale of the Screen for Child Anxiety Related Disorders [45]. A sum score of the nine items was calculated, with higher scores indicating more severe anxiety. Groups of participants *with* versus *without* anxiety were created using the established cutoff [45]. Depressive symptoms were measured using the Patient Health Questionnaire [46,47] with its two items. A higher sum score indicates more severe depressive symptoms. A validated cutoff was applied to categorize participants *with* and those *without*

noticeable depressive symptoms [46]. Furthermore, the self-reported HBSC symptom checklist [48] was administered to measure the frequencies of psychosomatic complaints during the past week. Participants were divided into groups of subjects who experienced each psychosomatic symptom *at least once* per *week* versus those who experienced it *less frequently*. The KIDSCREEN-10 Index, the SDQ, and the Screen for Child Anxiety Related Disorders were also applied in the BELLA study, and the HBSC-SCL was administered in the HBSC study, thus allowing comparisons with the COPSY data.

Data analysis—changes in HRQoL and mental health

First, the reported burden of the pandemic on children and adolescents was compared across the three COPSY waves. Second, the proportion of youth displaying impaired HRQoL, mental health problems, anxiety, depressive symptoms, and psychosomatic complaints was compared across all measurement points. Age- and gender-adjusted proportions were calculated using logistic regression models for each outcome. Data from the BELLA and HBSC studies were used to compare HRQoL and mental health outcomes with prepandemic reference data. Chi-square tests and effect sizes (Phi coefficient ϕ resp. Cramer's V, with .10 indicating a small, .30 a medium, and .50 a strong effect) were calculated for comparisons across the waves and for group comparisons. Gender differences were expressed as risk ratios (RRs) for girls. The chi-square tests as well as the ϕ and V statistics for comparisons across the COPSY waves do not take into account that the majority of measurements represent repeated measures of the same respondents. This led to lower statistical power in order to detect differences across the COPSY waves.

Furthermore, the individual stability and variability of HRQoL classification over the course of the pandemic (trajectories) were

analyzed by examining how respondents with low, medium, or high HRQoL in Wave 1 were classified in Waves 2 and 3.

Prior to analyzing the data, a power analysis was conducted using G-Power (Version 3.1). The minimum sample size based on a statistical significance of $p (\alpha) < .05$ and a power of $p (1-\beta) = 0.8$ for a medium effect (w = 0.3) between waves according to age groups (7–10 years, 11–13 years, 14–17 years) and female versus male was n = 88.

Data analysis—risk factors for lower HRQoL and mental health

To answer the second research question, it was examined whether a group of children are at higher risk of being impaired by the pandemic. Based on previous empirical evidence [5], a number of five risk factors (i.e., parental education, migration background, living space, parental mental health problems, and parental pandemic burden) were identified to define a risk group of vulnerable children and adolescents. Children were assigned to the risk group if their parents had a low level of education *and* either a migration background *or* lived in close quarters (<20 m^2 living space/person). Furthermore, children were assigned to the risk group if their parents had mental health problems *or* were extremely burdened by the pandemic. In total, n = 365 (17.2%) children and adolescents were assigned to the risk group. Children who did not meet the inclusion criteria of risk factors were defined as not risk group. Using logistic regression analyses, this risk group was examined for HRQoL impairments and mental health problems in each of the three waves using age and gender as covariates. In an additional logistic regression analysis, it was tested whether the schooling situation and the number of social contacts outside the family were associated with low HRQoL. These analyses were controlled for age and gender. Effects were described in terms of odds ratios (ORs). All analyses were performed using SPSS Version 26.

Results

Sociodemographics

Overall, n = 2,097 families with children and adolescents aged 7–17 years old (mean = 13.21; standard deviation = 3.30; 50.3% female) participated in the COPSY study (parent proxy reports). Of those, n = 1,531 children and adolescents aged 11–17 years old (mean = 14.82; standard deviation = 2.23; 53.9% female) completed the self-report survey. Sociodemographic characteristics are summarized in Table 1.

Changes in HRQoL during the pandemic

70.3% of children and adolescents aged 11–17 years reported being burdened by the pandemic at Wave 1, 82.8% at Wave 2 ($p < .001$; $\phi = 0.15$), and 82.0% at Wave 3 ($p = .522$; $\phi = 0.014$).

Before the pandemic, only 15.3% of children and adolescents reported low HRQoL. This increased to 39.8% at Wave 1 ($p < .001$; $\phi = 0.27$), followed by a further increase to 48.1% at Wave 2 ($p < .001$; $\phi = 0.08$), and then a decrease at Wave 3 to 35.5% ($p < .001$; $\phi = .13$). Thus, the prevalence of low HRQoL at Wave 3 is still more than twice as high as the prepandemic rate (see Figure 2). An analysis stratified by gender revealed that girls had a 1.2 to 2 fold higher risk of low HRQoL compared to boys (RR ranged between 1.2 and 2). Half of the youth (54.0%) reported medium HRQoL at the beginning of the pandemic, with the majority of

Table 1
Sociodemographic characteristics of the COPSY sample

	Children and adolescents aged 7–17 years (parent reports) (n = 2,097)		Children and adolescents aged 11–17 years (self-reports) (n = 1,531)	
	n (%)	M (SD)	n (%)	M (SD)
Age		13.21 (3.30)		14.82 (2.23)
7–10 years	566 (27.0)		-	
11–13 years	470 (22.4)		470 (30.7)	
14–17 years[a]	1,061 (50.6)		1,061 (69.3)	
Gender				
Male	1,030 (49.1)		495 (46.0)	
Female	1,055 (50.3)		580 (53.9)	
Other	10 (0.5)		2 (0.2)	
Age of the parent		44.41 (7.44)		45.93 (7.19)
Migration background				
No	1,741 (83.0)		1,274 (83.2)	
Yes	356 (17.0)		257 (16.8)	
Parental education				
Low	371 (17.7)		271 (17.7)	
Medium	1,216 (58.0)		868 (56.7)	
High	493 (23.5)		379 (24.8)	
No information	17 (0.8)		13 (0.8)	
Single parent				
No	1,678 (80.0)		1,211 (79.1)	
Yes	419 (20.0)		320 (20.9)	
Occupational status				
Full-time employed	1,069 (51.0)		808 (52.8)	
Part-time employed	616 (29.4)		433 (28.3)	
Self-employed	81 (3.9)		60 (3.9)	
Other employment	40 (1.9)		28 (1.8)	
Stay-at-home parent	142 (6.8)		92 (6.0)	
Retiree/pensioner	52 (2.5)		44 (2.9)	
On parental leave	31 (1.5)		18 (1.2)	
Unemployed	66 (3.1)		48 (3.1)	
COVID-19 infection				
A family member has been infected	361 (17.2)		259 (16.3)	
The child has been infected	78 (3.7)		53 (3.5)	
A relative has died of COVID-19	140 (6.7)		106 (6.9)	

Note. Unweighted data.
COPSY = COVID-19 and Psychological Health; M = mean; SD = standard deviation.
[a] n = 148 adolescents had already turned 18 when they participated in the survey but were included in the age group of 14- to 17-year-olds.

them remaining there across all waves (65.7%–72.1%). Of those who reported high HRQoL at the start of the pandemic, only a third (29%) maintained their high HRQoL over the course of the study. The majority of those who initially reported low HRQoL (57%–76%) continued to report low HRQoL during the latter Waves 2 and 3. All reported percentages were adjusted for age and gender.

Changes in mental health during the pandemic

Prior to the pandemic, less than one fifth (17.6%) of all children and adolescents aged 7–17 years had overall mental health problems. This number rose to 28.8% in Wave 1 and 30.6% in Wave 2. In Wave 3, there was a slight but nonsignificant decrease in mental health problems to 28.0%, which is still substantially higher than before the pandemic.

While emotional problems, hyperactivity, conduct problems, and peer problems increased from prepandemic to pandemic
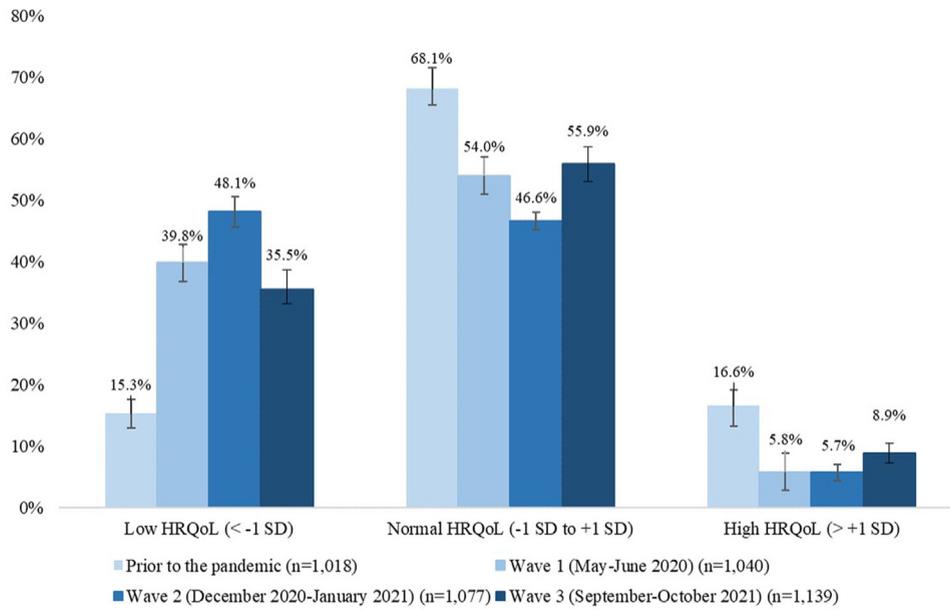
Figure 2. Percentages of children and adolescents with low, normal, and high health-related quality of life measured prior to the COVID-19 pandemic (BELLA study), in Wave 1, Wave 2, and Wave 3 of the COPSY study.

data of Wave 1, conduct and peer problems continued to increase at Wave 2. Hyperactivity decreased at Wave 2, followed by an additional small decrease at Wave 3. All subscales at Wave 3 were higher compared to prepandemic data. Children and adolescents

had continuously increasing emotional problems over the course of the pandemic (see Table 2).

Children and adolescents aged 11–17 years reported more symptoms of anxiety during the first wave (23.6%) than before

Table 2
Mental health problems and anxiety and depressive symptoms in children and adolescents prior to the COVID-19 pandemic (BELLA study), and in Waves 1, 2, and 3 of the COPSY study

	BELLA Prepandemic (n = 1,552)	COPSY Wave 1 (n = 1,586)	COPSY Wave 2 (n = 1,625)	COPSY Wave 3 (n = 1,618)	BELLA versus COPSY Wave 1		BELLA versus COPSY Wave 2		COPSY Wave 1 versus Wave 2		COPSY Wave 2 versus Wave 3	
	%	%	%	%	p-value	Effect size (ϕ)	p-value	Effect size (ϕ)	p-value	Effect size (ϕ)	p-value	Effect size (ϕ)
Mental health problems (total)												
Normal	82.4	71.2	69.4	72.0								
Borderline/abnormal	17.6	28.8	30.6	28.0	**< .001**	**0.13**	**< .001**	**0.15**	.264		.104	
Emotional problems												
Normal	83.6	80.0	76.8	74.6								
Borderline/abnormal	16.4	20.0	23.2	25.4	**.009**	0.05	**< .001**	0.09	**.028**	0.04	.144	
Conduct problems												
Normal	86.9	81.7	81.3	82.2								
Borderline/abnormal	13.1	18.3	18.7	17.8	**<.001**	0.07	**< .001**	0.08	.770		.507	
Hyperactivity												
Normal	87.2	78.1	80.3	80.9								
Borderline/abnormal	12.8	21.9	19.7	19.1	**< .001**	**0.12**	**< .001**	0.09	.125		.666	
Peer problems												
Normal	88.6	78.7	73.8	76.2								
Borderline/abnormal	11.4	21.3	26.2	23.8	**< .001**	**0.13**	**< .001**	**0.19**	**.001**	0.06	.115	
Anxiety symptoms	(n = 1,018)	(n = 1,040)	(n = 1,077)	(n = 1,139)								
No	85.1	76.4	69.9	73.8								
Yes	14.9	23.6	30.1	26.2	**< .001**	**0.12**	**< .001**	**0.18**	**.002**	0.07	.086	
Depressive symptoms	(n = 1,018)	(n = 1,040)	(n = 1,077)	(n = 1,139)								
No	90.0	88.9	85.1	88.6								
Yes	10.0	11.1	14.9	11.4	.320		**< .001**	0.08	**.012**	0.05	**.007**	0.06

Note. Weighted data, percentages adjusted for age and gender. *Normal* versus *borderline/abnormal*: Groups were compared based on the German cutoffs of the SDQ. *p*-values indicating significant differences ($p \leq .050$) and effect sizes (Phi coefficient ϕ) indicating small effects ($\phi \geq 0.10$) are printed in bold type. Effect sizes are only reported for significant differences.
BELLA = Behaviour and Well-being of Children and Adolescents; COPSY = COVID-19 and Psychological Health; SDQ = Strengths and Difficulties Questionnaire

the pandemic (14.9%). Anxiety further increased in Wave 2 (30.1%), while in Wave 3 anxiety levels decreased slightly to 26.2%, but were still higher compared with prepandemic times (see Table 2). All reported percentages were adjusted for age and gender.

Depressive symptoms in adolescents aged 11−17 years slightly and nonsignificantly increased from prepandemic data to Wave 1 (10.0%−11.1%), the increase reached significance in Wave 2 (14.9%), followed by a significant decrease in Wave 3 (11.4%). The *p*-values and effect sizes are reported in Table 2, most reported changes were negligible to small.

Similarly to the gender difference in HRQoL, girls were more likely to report anxiety (RR ranged between 1.4 and 2.1) and more likely to report depressive symptoms (RR ranged between 1.4 and 1.9).

Changes in psychosomatic complaints

Psychosomatic complaints in adolescents aged 11−17 years increased during the pandemic as reported for Waves 1 and 2 elsewhere [5]. In Wave 3, the prevalence further increased for stomachaches (39.2%; *p* = .169; φ = 0.03) and headaches (48.7%; *p* = .005; φ = 0.06), and remained high for irritability (57.0%), sleeping problems (46.0%), and feeling low (41.2%). In Wave 3, all psychosomatic complaints were more prevalent compared to prepandemic and Wave 1 data (see Figure A1). Girls were at a higher risk of psychosomatic complaints, in particular with regard to having headaches (RR between 1.2 and 1.9) and feeling low (RR between 1.3 and 1.9).

Children and adolescents at risk for impaired HRQoL and mental health

At all three waves, children and adolescents of the risk group (for definition, see section Data analysis−risk factors for lower HRQoL and mental health) had a higher risk of experiencing low HRQoL (ORs ranged from 2.1 to 2.7), mental health problems (ORs ranged from 2.7 to 3.0), anxiety symptoms (ORs ranged from 1.7 to 2.2), and depressive symptoms compared with their peers (ORs ranged from 2.3 to 4.1). The prevalence of being burdened by the pandemic, having low HRQoL, and overall mental health problems was higher for the risk group across all 3 waves (see Figure A2). Regarding age- and gender-specific differences, adolescents aged 14−17 years had a lower risk of mental health problems at Waves 2 and 3 compared with 7- to 10-year-olds (ORs ranged from 0.3 to 0.6). Furthermore, 14- to 17-year-olds had a lower risk of anxiety at Waves 1 and 2 compared with 11- to 13-year-olds (ORs ranged from 0.5 to 0.6, see Table 3).

The potential role of homeschooling and reduced social contacts for impaired HRQoL

In all three waves, reduction of social contacts outside the family was associated with a higher risk of low HRQoL (ORs ranged from 2.3 to 5.6). Schooling mainly at home was associated with ORs between 1.2 and 3.2 for low HRQoL. The ORs for schooling only sometimes/irregularly at school ranged from 0.8 to 1.5.

Discussion

The results of the German population-based longitudinal COPSY study indicate a significant increase in low HRQoL and mental health problems at the start of the pandemic compared with prepandemic levels. HRQoL impairments and mental health problems continuously increased in Waves 1 (spring 2020) and 2 (winter 2020/21), followed by a slight improvement in Wave 3 (autumn 2021). However, the level of mental health deterioration remains high and almost double that before the pandemic. The slight improvements in adolescent HRQoL and mental health in Wave 3 could be explained by the low infection rates, vaccination, and the loosening of restrictions in Germany in autumn 2021.

The initial drastic decrease in HRQoL at the start of the pandemic has been replicated by two further German studies, which also used the KIDSCREEN-10 prior to and during the pandemic [6,7]. Regarding mental health problems, internalizing problems (such as emotional problems) remained high at Wave 3, while externalizing problems (such as hyperactivity) significantly decreased. This may have been the result of children and adolescents having had more freedom to move around in autumn 2021 compared with during the lockdowns. These results are largely in line with studies from the United States [30], the United Kingdom [31], and Japan [28] that also used the SDQ. Minor differences in prevalence rates between the studies may be due to differing data collection times and country restrictions. We found that reduced social contacts and school-closing or irregular schooling were associated with lower HRQoL. The increase in social contacts and schooling from Wave 2 to 3 thus could also explain the decrease in low HRQoL from Wave 2 to 3.

As previously reported [5,21], the COPSY study surprisingly did not find a significant rise in depression levels from prepandemic to Wave 1 data, but a significant peak of depressive symptoms at Wave 2, while depressive symptoms decreased again at Wave 3. Depression levels across all waves (10%−15%) are interestingly below the ones reported in two meta-analyses by Racine et al. (25%) [20] and Ma et al. (29%) [18]. This may be because those meta-analyses primarily summarize Asian studies with high infection rates and stricter lockdown measures.

In terms of gender differences, we found that a higher proportion of girls reported low HRQoL, anxiety, depressive symptoms, and psychosomatic complaints both before and during the pandemic. Further in-depth analyses on gender-specific risks and coping strategies are needed.

In addition, the findings of the COPSY study suggest that a group of socially disadvantaged children and adolescents as well as children of parents with mental health problems are at a particularly high risk of experiencing low HRQoL, mental health problems, and depressive symptoms during the pandemic. This is in line with previous COPSY results [5,21] as well as other studies of risk factors [29,33]. Information about these risk factors could help to screen for mentally burdened children and adolescents and develop targeted, low-threshold prevention and intervention programs to reduce social inequalities in mental health. Further in-depth analyses using multivariate and multilevel statistical models and including additional risk and resource factors will be carried out and published in a separate article.

The strengths of the COPSY study include its longitudinal design, the large population-based sample and the coverage of a long time span across the pandemic; the availability of nationally representative, prepandemic data sets for comparison; and the

Table 3
Associations between belonging to a risk group and low HRQoL, mental health problems, anxiety and depressive symptoms measured using odds ratios for 11- to 17-year-olds across Waves 1, 2, and 3 of the COPSY study

Low HRQoL (KIDSCREEN-10)	Wave 1	Wave 2	Wave 3
	OR (95% CI)	OR (95% CI)	OR (95% CI)
Risk group[a]	**2.079 (1.465; 2.950)**	**2.653 (1.894; 3.717)**	**2.364 (1.722; 3.245)**
Female	1.418 (0.878; 2.290)	1.003 (0.648; 1.551)	1.008 (0.668; 1.519)
14–17 years	0.917 (0.610; 1.378)	1.211 (0.842; 1.742)	0.921 (0.643; 1.319)
Female 14–17 years	0.954 (0.542; 1.679)	1.152 (0.680; 1.950)	1.448 (0.870; 2.413)
Nagelkerke's Pseudo-R^2	0.033	0.048	0.042
Hosmer–Lemeshow test of fit	$p = .776$	$p = .983$	$p = .571$
Mental health problems (SDQ)	**Wave 1**	**Wave 2**	**Wave 3**
	OR (95% CI)	OR (95% CI)	OR (95% CI)
Risk group[a]	**2.731 (2.012; 3.707)**	**2.764 (2.080; 3.674)**	**3.049 (2.278; 4.081)**
Female	**0.594 (0.375; 0.940)**	0.640 (0.406; 1.007)	0.817 (0.493; 1.354)
11–13 years	0.716 (0.463; 1.106)	0.771 (0.508; 1.170)	1.335 (0.852; 2.091)
14–17 years	**0.318 (0.207; 0.488)**	**0.412 (0.274; 0.618)**	**0.621 (0.401; 0.962)**
Female 11–13 years	1.476 (0.770; 2.828)	1.016 (0.532; 1.939)	0.748 (0.377; 1.485)
Female 14–17 years	1.365 (0.706; 2.639)	1.653 (0.906; 3.018)	1.235 (0.643; 2.373)
Nagelkerke's Pseudo-R^2	0.095	0.071	0.071
Hosmer–Lemeshow test of fit	$p = .854$	$p = .857$	$p = .428$
Generalized anxiety (SCARED)	**Wave 1**	**Wave 2**	**Wave 3**
	OR (95% CI)	OR (95% CI)	OR (95% CI)
Risk group[a]	**2.183 (1.506; 3.163)**	**1.687 (1.206; 2.361)**	1.297 (0.923; 1.823)
Female	1.088 (0.639; 1.853)	**0.593 (0.367; 0.957)**	**1.558 (1.021; 2.380)**
14–17 years	**0.545 (0.339; 0.878)**	**0.509 (0.342; 0.759)**	0.769 (0.518; 1.141)
Female 14–17 years	**2.113 (1.112; 4.015)**	**4.424 (2.472; 7.917)**	1.084 (0.633; 1.858)
Nagelkerke's Pseudo-R^2	0.058	0.065	0.024
Hosmer–Lemeshow test of fit	$p = .858$	$p = .994$	$p = .706$
Depressive symptoms (PHQ-2)	**Wave 1**	**Wave 2**	**Wave 3**
	OR (95% CI)	OR (95% CI)	OR (95% CI)
Risk group[a]	**3.684 (2.385; 5.690)**	**4.070 (2.796; 5.925)**	**2.333 (1.534; 3.547)**
Female	1.489 (0.720; 3.080)	0.506 (0.250; 1.026)	0.971 (0.494; 1.907)
14–17 years	0.773 (0.393; 1.519)	0.878 (0.519; 1.485)	1.015 (0.565; 1.824)
Female 14–17 years	1.095 (0.457; 2.627)	**3.251 (1.436; 7.358)**	1.899 (0.844; 4.273)
Nagelkerke's Pseudo-R^2	0.074	0.104	0.044
Hosmer–Lemeshow test of fit	$p = .957$	$p = .870$	$p = .729$

CI = confidence interval; HRQoL = health-related quality of life; OR = odds ratio; SDQ = Strengths and Difficulties Questionnaire; SCARED = Screen for Child Anxiety Related Disorders; PHQ-2 = Patient Health Questionnaire.

[a] _Note._ Risk groups were predefined as children/adolescents with low parental education and/or migration status and/or confined living conditions and/or previous parental mental illness. Numbers in bold indicate statistically significant results. The reference group for all analyses except SDQ was boys aged 11–13 years not belonging to the risk group. For the SDQ analyses, the reference group was boys aged 7–10 years not belonging to the risk group.

administration of well-established instruments. The limitations of the study include the fact that the sample was drawn by matching data from the 2018 German Microcensus, meaning the findings may not be generalizable to other countries; the survey was conducted using an online panel with incentives, which may have influenced participation; due to pandemic restrictions highly burdened families or children with mental disorders might have been less likely to participate in the survey; due to the online administration, only families with Internet access could participate. Lastly, the study does not allow any causal conclusions to be drawn about what exactly accounts for the main findings.

Overall, the third wave of the COPSY study demonstrates lingering impaired HRQoL and mental health for a substantial proportion of children, particularly the at-risk groups, with only slight improvements in mental health in autumn 2021. Further waves of the COPSY study are underway to further examine mental health trajectories through multivariate statistical panel model analysis and in-depth subgroup analysis. Research is needed that investigates the pandemic-related causes of low HRQoL and monitors mental health trajectories in more detail. In particular, we call for research that is comparable, using the same measures, comparable time intervals, designs and methods, and capturing infection rates, and policy responses to the pandemic for cross- and within-country comparisons. This is crucial as it will lead to an understanding of national and regional differences in child and adolescent mental health trajectories during the pandemic, and clarify the effect of different policy responses to the COVID-19 pandemic on these key variables [49].

It is also imperative that awareness for children and adolescents in need of mental support be increased in policy, educational, and health care settings. Facing challenges like the pandemic, policymakers need to pave the way for better screening for at-risk children and adolescents, and support them through prevention and intervention programs that might mitigate the effects the pandemic appears to have on them.

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Supplementary Data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.jadohealth.2022.06.022.

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