

SHORT COMMUNICATION

Impact of COVID-19 pandemic on mental health and health behaviors in Swedish adolescents

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Abstract

Aims: There is an urgent need to explore the impact of the COVID-19 pandemic on adolescent mental health and health behaviours. To date, there are no such studies on Swedish adolescents. As COVID-19 emerged in the middle of our ongoing 2-year follow-up examination of the Study of Adolescence Resilience and Stress, we had the unique opportunity to use the corona outbreak as a ‘natural experiment’ to study the impact of COVID-19 on 15-year-old adolescents in Sweden. **Methods:** Adolescents (baseline age 13.6 ± 0.4 years) were recruited from schools in western Sweden (during the COVID-19 outbreak schools were kept open for those under 16 years of age). The COVID-19 pandemic reached Sweden on 31 January 2020. A total of 1316 adolescents answered the 2-year follow-up survey before (unexposed to COVID-19 pandemic, controls) and 584 after 1 February 2020 (COVID-19-exposed). Data on stress, psychosomatic symptoms, happiness, relationships with parents and peers, school and health behaviours were collected. **Results:** Adolescents reported higher levels of stress and psychosomatic symptoms and lower levels of happiness at follow-up compared to baseline. These changes occurred to a similar extent in both the control and COVID-19-exposed groups. Likewise, the COVID-19-exposed group showed no deterioration in peer relations or relations with parents versus controls. We did not find any significant differences between groups regarding sleep duration and physical activity. **Conclusions: Swedish adolescents exposed to COVID-19 during most of 2020 showed no differences in longitudinal changes in mental health, relationships with parents and peers, and health behaviours compared to those not exposed to COVID-19.**

Keywords: Adolescents, COVID-19, psychosomatic symptoms, stress, happiness, health behaviours, longitudinal

Background

The COVID-19 pandemic imposes a massive change to the psychosocial environment in affected countries. There is an urgent need to explore the effects of this pandemic on the mental health in adolescents [1, 2].

Data regarding the COVID-19 pandemic’s impact on adolescents are evolving [3]. There are studies reporting a high prevalence of anxiety and depressive symptoms, increased loneliness, perceived changes in relationships with family and friends [4–7]. Impacts

of COVID-19 on children and adolescents’ health behaviour have also been reported, such that children and youth have had decreased physical activity levels, increased sedentary behaviour and increased sleep during the outbreak [8–10].

Unlike many other nations, Sweden has kept its schools open for those under 16 years of age during the early phase of the COVID-19 outbreak [11]. Sweden has implemented physical distancing, rather than enforcing lockdown, to minimise the spread of COVID-19 [12]. To date, there is no published study

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on the impact of COVID-19 on mental health and health behaviour in Swedish adolescents.

The aim of this study was hence to investigate the impacts of COVID-19 on mental health, perceived relationships with parents and peers and health behaviours in 15-year-old adolescents in Sweden. We used data collected from our ongoing longitudinal Study of Adolescence Resilience and Stress (STARS). The COVID-19 pandemic was confirmed to have reached Sweden on 31 January 2020, at the same time as the World Health Organization (WHO) declared a public health emergency of international concern [11]. Given that COVID-19 emerged in the middle of our ongoing 2-year follow-up examination, we had the unique opportunity, using the prevailing situation as a ‘natural experiment’ in studying the initial effects of COVID-19 on adolescents.

The advantages are two-fold. First, we had pre-COVID-19 comparative baseline data characterising all adolescents. Only longitudinal studies that include a baseline measure before COVID-19 can truly detect changes related to the COVID-19 pandemic, and studies with pre-COVID-19 data are few [13]. Second, as mental health problems are known to increase from early adolescence onwards [14], it is important to ensure that the potential changes in mental health problems during ongoing COVID-19 are not simply due to such age-related effects. In this respect, we were able to study the effects of COVID-19 by comparing adolescents with or without COVID-19 exposure.

Methods

We used data from the baseline and 2-year follow-up surveys of the STARS. At baseline, participants were 7th grade pupils recruited from 54 schools in 16 municipalities in western Sweden. A total of 2283 pupils (age 13.6 ± 0.4 years, 44% boys) were examined during September 2015 and June 2019. A total of 1900 adolescents participated in the 2-year follow-up survey, divided into control (re-examined during September 2017 and January 2020) and COVID-19-exposed (re-examined during February and November 2020). The time between the two waves was 2.0 ± 0.2 (range 0.8–2.6) and 2.0 ± 0.1 (range 1.4–2.6) years for the control and COVID-19-exposed groups, respectively. The study was approved by the ethics committee at the Sahlgrenska Academy, University of Gothenburg, and written informed consents were obtained.

Adolescents answered a web questionnaire regarding stress [15], psychosomatic symptoms [16], happiness [17], relations with parents and home life [18], social support and peers [18], school environment

[18], sleep duration and physical activity [19], feeling in general and belief in the future. Data on gender and migration background were collected. Family socioeconomic status (SES) was measured using the family affluence scale [20].

The paired Student’s *t*-test was used for analysing differences between baseline and 2-year follow-up. General linear models (GLMs) for repeated measures were used to examine group differences in repeated measure effects. SPSS 27 was used for statistical analyses. $P \leq 0.05$ was considered statistically significant.

Results

There was no significant difference between the two groups regarding sex (control: 42.7% boys, COVID-19-exposed: 46.8% boys) and family SES (control: 26.3%/58.7%/15%; COVID-19-exposed: 25%/62.6%/12.5%, low/medium/high SES, respectively). The percentage of adolescents with migrant background was lower in the COVID-19-exposed than the control group (14.6% vs. 22.5%, $P < 0.001$, chi-square test).

Compared to baseline, levels of perceived stress and psychosomatic symptoms increased, while levels of happiness, peer relations, relations with parents, school satisfaction, sleep hours and days with at least 60 minutes moderate-to-vigorous physical activity per week decreased at the 2-year follow-up (Table I). No changes in leisure-time exercise were found.

Analysing group-related differences in repeated measure effects over the 2-year period, we did not find any statistically significant difference between the control and COVID-19-exposed groups in the variables examined, except one, namely psychosomatic symptoms. The level of psychosomatic symptoms increased over the 2-year period in the control but not in the COVID-19-exposed group (Table I).

Given that sex-related differences were observed in almost all variables (data not shown), we did GLM analysis with sexes separated. The changes over the 2-year period were similar among boys (Table II) and girls (Table III), except psychosomatic symptoms, with boys reporting a decreased level and girls reporting an increased level over the 2-year period, and the days with at least 60 minutes physical activity per week being significantly decreased in girls but not in boys.

The group-related difference in psychosomatic symptoms disappeared when we analysed boys and girls separately (Tables II and III). On the other hand, we observed group-related differences in the days with at least 60 minutes moderate-to-vigorous physical activity per week and belief in the future in

Table 1. Baseline and 2-year follow-up measures in adolescents, and differences in repeated measure effects between control and COVID-19-exposed group.

	Control			COVID-19-exposed			GLMs for repeated measures			
	N	Baseline	2-year follow-up	P value	N	Baseline	2-year follow-up	P value	P for repeated measure effect	P for group difference
Age (years)	1317	13.5±0.4 (11.6–16.1)	15.5±0.4 (13.7–17.7)	<0.001	584	15.5±0.4 (14.5–18.0)	15.5±0.4 (14.5–18.0)	<0.001	<0.001	0.424
Stress	1306	15.1±5.9	16.7±6.4	<0.001	577	15.8±6.3	17.1±6.3	0.674	0.007	0.048
Psychosomatic symptoms	1306	11.2±5.4	11.8±6.0	<0.001	577	12.0±5.7	12.1±6.2	<0.001	<0.001	0.551
Happiness	1308	30.5±6.3	28.2±6.9	<0.001	580	29.6±7.1	27.2±7.5	0.076	<0.001	0.794
Peer relations	1311	16.2±2.9	15.9±3.4	<0.001	582	16.1±3.4	15.8±3.5	<0.001	<0.001	0.667
Relations with parents	1304	20.8±3.3	20.3±3.9	<0.001	580	20.9±3.5	20.3±3.8	<0.001	<0.001	0.11
School satisfaction	1307	11.2±1.9	10.9±2.2	<0.001	579	11.1±2.0	10.6±2.2	<0.001	<0.001	0.241
Sleep hours on a school day	1313	8.58±0.85	7.99±0.95	<0.001	582	8.50±0.86	7.97±0.95	<0.001	<0.001	0.162
Sleep hours on a non-school day	1313	9.85±1.25	9.50±1.26	<0.001	582	9.84±1.29	9.59±1.25	<0.001	<0.001	0.453
Physical activity 60 min/day (days/week)	1315	3.9±1.8	3.9±1.9	0.002	583	4.1±1.7	3.9±1.9	0.049	0.033	
Weekly duration of leisure-time exercise	1315	4.1±1.4	4.1±1.5	0.954	583	4.1±1.4	4.1±1.5	0.201	0.312	0.283
Feeling in general	1316	8.1±1.6	7.4±1.9	<0.001	584	7.8±1.7	7.3±1.9	<0.001	<0.001	0.256
Belief in the future	1300	8.3±1.4	8.3±1.6	0.363	573	8.3±1.6	8.1±1.7	0.077	0.044	0.305

Variables are presented as mean ±SD. The paired Student's *t*-test was used for analysing differences between the baseline and 2-year follow-up. General linear models (GLMs) for repeated measures were used to examine group differences in repeated measure effects.

Table II. Baseline and 2-year follow-up measures in male adolescents, and differences in repeated measure effects between control and COVID-19-exposed group.

	Control			COVID-19-exposed			GLMs for repeated measures			
	Baseline	2-year follow-up	P value	Baseline	2-year follow-up	P value	P for repeated measure effect	P for repeated group difference		
	N			N						
Age (years)	565	13.5±0.4 (11.6–14.8)	15.5±0.4 (13.7–16.6)	273	13.5±0.4 (12.7–14.9)	15.5±0.4 (14.5–16.9)				
Stress	558	13.5±5.6	14.3±5.8	0.001	270	14.0±5.9	14.5±5.7	0.188	0.003	0.689
Psychosomatic symptoms	558	9.5±5.0	9.1±5.2	0.071	270	10.0±5.1	9.0±5.5	0.003	<0.001	0.115
Happiness	560	32.1±5.3	30.7±6.0	<0.001	271	31.4±6.7	29.9±6.8	<0.001	<0.001	0.818
Peer relations	561	15.9±2.8	15.5±3.4	0.003	272	15.8±3.2	15.6±3.6	0.234	0.007	0.475
Relations with parents	558	21.2±3.0	20.9±3.6	0.043	270	21.2±3.4	20.9±3.7	0.148	0.018	0.914
School satisfaction	559	11.1±1.9	10.8±2.3	0.006	270	11.0±2.0	10.6±2.3	0.013	<0.001	0.651
Sleep hours on a school day	563	8.73±0.75	8.08±0.96	<0.001	272	8.68±0.79	8.16±0.91	<0.001	<0.001	0.066
Sleep hours on a non-school day	563	9.81±1.27	9.48±1.29	<0.001	272	9.82±1.33	9.50±1.18	<0.001	<0.001	0.974
Physical activity 60min/day (days/week)	564	4.3±1.8	4.1±1.9	0.09	273	4.2±1.7	4.3±1.9	0.683	0.53	0.189
Weekly duration of leisure-time exercise	564	4.3±1.3	4.3±1.4	0.63	273	4.2±1.3	4.3±1.5	0.05	0.058	0.176
Feeling in general	564	8.5±1.4	8.0±1.7	<0.001	273	8.3±1.6	8.0±1.7	0.001	<0.001	0.426
Belief in the future	557	8.4±1.3	8.5±1.6	0.44	268	8.3±1.7	8.5±1.5	0.218	0.15	0.585

Variables are presented as mean±SD. The paired Student's *t*-test was used for analysing differences between the baseline and 2-year follow-up. General linear models (GLMs) for repeated measures were used to examine group differences in repeated measure effects.

Table III. Baseline and 2-year follow-up measures in female adolescents, and differences in repeated measure effects between control and COVID-19-exposed group.

	Control			COVID-19-exposed			GLMs for repeated measures			
	N	Baseline	2-year follow-up	P value	N	Baseline	2-year follow-up	P value	P for repeated measure effect	P for group difference
Age (years)	752	13.6±0.4 (12.0–16.1)	15.5±0.4 (14.3–17.7)	<0.001	311	13.5±0.4 (12.3–16.0)	15.5±0.4 (14.5–18.0)	<0.001	<0.001	0.907
Stress	748	16.3±5.9	18.4±6.3	<0.001	307	17.4±6.2	19.4±5.8	0.001	<0.001	0.366
Psychosomatic symptoms	748	12.4±5.4	13.8±5.7	<0.001	307	13.8±5.5	14.8±5.5	<0.001	<0.001	0.411
Happiness	748	29.3±6.7	26.4±6.9	0.037	309	28.1±7.1	24.8±7.4	0.186	0.02	0.806
Peer relations	750	16.5±3.0	16.2±3.3	<0.001	310	16.3±3.6	16.0±3.4	<0.001	<0.001	0.564
Relations with parents	746	20.6±3.6	19.9±4.0	<0.001	310	20.7±3.5	19.9±3.9	<0.001	<0.001	0.069
School satisfaction	748	11.3±1.9	11.0±2.1	<0.001	309	11.2±2.1	10.6±2.1	<0.001	<0.001	0.989
Sleep hours on a school day	750	8.47±0.89	7.92±0.94	<0.001	310	8.35±0.88	7.80±0.96	0.014	<0.001	0.054
Sleep hours on a non-school day	750	9.89±1.22	9.52±1.23	0.858	310	9.85±1.25	9.66±1.30	0.01	<0.001	0.025
Physical activity 60min/day (days/week)	751	3.7±1.7	3.7±1.9	0.635	310	3.9±1.8	3.6±1.8	0.90	0.718	0.872
Weekly duration of leisure-time exercise	751	4.0±1.4	3.9±1.5	<0.001	311	4.0±1.4	4.0±1.5	<0.001	<0.001	0.537
Feeling in general	752	7.8±1.6	7.0±1.9	0.056	305	7.4±1.6	6.6±1.9	0.001	<0.001	0.041
Belief in the future	743	8.2±1.5	8.1±1.6			8.2±1.5	7.8±1.7			

Variables are presented as mean±SD. The paired Student's *t*-test was used for analysing differences between the baseline and 2-year follow-up. General linear models (GLMs) for repeated measures were used to examine group differences in repeated measure effects.

girls but not boys, both variables decreased significantly in the COVID-19-exposed group but not in controls.

Changes of the variables over the 2-year period did not differ with respect to time of COVID-19 exposure (see Supplemental material).

Discussion

Using longitudinal data collected in the STARS cohort, we found that adolescents reported higher levels of stress and psychosomatic symptoms and lower levels of happiness from 13 to 15 years of age. These changes occurred in both the controls and COVID-19-exposed groups, with no differences between the groups, suggesting that the changes are age related rather than COVID-19 related.

The present results contrast with previous studies showing that adolescents experienced an increase in depressive symptoms, anxiety and loneliness and a decrease in life satisfaction compared to pre-COVID-19 measures [6, 7]. These studies were performed in countries where schools were temporarily closed in an attempt to contain the spread of the COVID-19 pandemic. The most distressing issue for adolescents during COVID-19 was not being able to see their friends, and perceived social changes were associated with an increase in mental health problems [7]. Adolescents were more concerned about governmental restrictions designed to contain the spread of the virus than the virus itself [7]. Furthermore, experiencing difficulties with online learning significantly moderated changes in depressive symptoms.

From February to November, the period when we collected data for the COVID-19-exposed group, Sweden kept its schools open for those under 16 years of age. This may have helped adolescents to keep a relatively 'normal' life despite the ongoing pandemic. This notion is supported by our observations that adolescents in the COVID-19-exposed group did not experience worse changes in peer relations than those in the control group. Furthermore, there were no significant differences between the control and the COVID-19-exposed group regarding sleep duration and physical activity, suggesting that adolescents in the COVID-19-exposed group could keep their daily routines during the pandemic.

Conclusions

Swedish adolescents exposed to COVID-19 showed no differences in longitudinal changes in mental health, relationships with parents and peers, and health behaviours as compared to those not exposed

to COVID-19. This may be explained by the Swedish authorities' decision to keep schools open to this age group.

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Supplemental material

Supplemental material for this article is available online.

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