

Supplementary Material for “General anxiety among Finnish youth from 2013 to 2021 - trend and the impact of COVID-19”

Details and the coding of the measures

Generalized anxiety

To assess anxiety, we used the 7-item Generalized Anxiety Disorder Scale (GAD-7) (Spitzer et al., 2006). The GAD-7 is a brief self-report scale designed to identify probable cases of generalized anxiety disorder (GAD) by covering its key symptoms. The GAD-7 is widely used and has proved to be a reliable and valid instrument for measuring generalized anxiety in the general population both among adults (Löwe et al., 2008) and adolescents (Tiirikainen et al., 2018). The GAD-7 questionnaire asks respondents to indicate how often they have been bothered by each of the seven symptoms over the past 2 weeks (Spitzer et al., 2006). The answers are rated on a 4-point scale as 0 (not at all), 1 (several days), 2 (more than half the days), and 3 (nearly every day), resulting in GAD-7 sum scores ranging from 0 to 21. When calculating the sum score, a maximum of two missing items were allowed (replaced by the mean of the respondent's items; done for 2.4% of the cases). The sum score was not calculated in 1.0% of the cases due to three or more missing items. We employed the most often used cut-off of 10 points or more to indicate cases with moderate to severe self-reported generalized anxiety symptoms (Spitzer et al., 2006), hereafter “generalized anxiety” or GA for short.

As the SHP is available in several languages, including Finnish, Swedish, Northern Sámi, English, and Russian, the GAD-7 versions for these languages approved by the developers of the measure were used (except for Northern Sámi). Most respondents answered using the Finnish version of the questionnaire, for example, in 2021 94.7% used Finnish, 4.7%

Swedish, 0.5% English, 0.1% Russian, and less than 0.01% the Northern Sámi language version.

Sex and gender

The respondents were asked to report their sex (male or female) with the question “What is your official gender?” (in the English-language version; note that in Finnish and Swedish, used by 99.4% of the respondents, there is no distinction between sex and gender). The intention was to elicit their assigned sex at birth, noted in their official identity documents. From 2017 onwards, there has been an additional question about perceived gender identity. In the data comprising 2013–2021, there were 1,624 (0.2%) cases with missing information on sex that were left out from the analyses. These included 1,162 cases (0.3% of those participating in 2017–2021) not reporting their sex but reporting perceived gender instead. For supplementary analyses, categories of cisgender (perceived gender same as assigned sex at birth) and transgender identity (perceived gender different from assigned sex at birth) were formed (see Supplementary Table S2). There were 5625 (4.3%) respondents in 2017, 4745 (3.1%) in 2019, and 6928 (4.4%) in 2021 who identified as transgender.

Age

The respondents reported their age at the time of answering the questionnaire. For 8,426 (1.1%) cases with missing information on age, age was coded with the mode age of their current grade. There were 1,676 (0.2%) cases reporting unreliable age—too young or too old for the given school grade (e.g., less than 15 years old in upper secondary education). These were coded as missing information and thereby excluded from the analyses. The mean age of the total sample was 15.8 (SD = 1.30) years. For the analyses, the following three age groups were formed: 13–15-year-olds, 16–17-year-olds and 18–20-year-olds (Table 1). Of note, however, is that there were only 403 respondents aged 13 years old in the age group of 13–15-year-olds.

Parental education

Respondents were asked to report their mother's and father's highest education with the following options: (1) basic compulsory; (2) general upper secondary or vocational; (3) general upper secondary/vocational + additional vocational studies; (4) university or university of applied sciences. From these responses a two-category variable "Higher parental education" (yes/no) was formed indicating that at least one parent had a university degree.

Immigrant status/family origin

Respondents were asked to report their own country of birth and their mother's and father's country of birth. From these, a four-category variable was formed: (1) both parents and the respondent of Finnish origin; (2) at least one parent of foreign origin; (3) both parents of foreign origin, participating adolescent born in Finland; (4) parents and participating adolescent of foreign origin.

Region

Regional State Administrative Agency codes were used to indicate the region of the country where the respondent was living. In Finland, there are seven such agencies (six in mainland Finland and the State Department of Åland) representing different parts of the country (<https://avi.fi/en/about-us>). The agencies and regions they represent are meaningful in the present analyses not only due to the differences in COVID-19 incidence rates between regions from 2020 up to spring 2021, when the last SHP was conducted, but also because these agencies decided on and administered many of the COVID-19 related restrictions, including restrictions on schools, leisure time activities, and hobbies.

Regional incidence of COVID-19 infections

For each region, the rate of COVID-19 infections was calculated for the period August 1, 2020, to May 31, 2021 (the school year 2020–2021) per 100 000 inhabitants (population of December 31, 2020). Data for COVID-19 incidences were retrieved from the Finnish

National Infectious Diseases Register

(<https://www.thl.fi/episeuranta/tautitapaukset/coronamap.html>).

Time spent in remote learning

The categorical variable *Time spent in remote learning* was based on the question “Have you been receiving remote learning because of the coronavirus epidemic during this school year?”

Respondents were asked to estimate the total length of the remote learning periods for the autumn and spring terms with options “not at all”, “less than 1 month”, “1–2 months”, and “over 2 months”. For the present analyses, the answers for autumn and spring terms were combined to reflect the whole school year 2020–2021: (1) less than 1 month per semester; (2) 1–2 months per semester at most; (3) over 2 months in either semester; (4) over 2 months in both semesters.

Support received in remote learning

The categorical variable *Support received in remote learning* was based on the question:

“During this school year, have you received support and help for learning and schoolwork while in remote learning?”. From the five response options, a three-category variable was constructed: (1) not needed/received a lot; (2) received some; (3) not received, would have needed; and the answer “I have not had remote learning” (13.4%) was coded as missing and excluded from this variable.

Exclusions due to implausible responding

In the analyses comprising only the years 2017–2021, 1,952 (0.4%) cases were excluded due to implausible (or unreliable) responding, namely reporting in three questions on disabilities that they were “completely unable” to see, hear, and walk, which would mean that they would be highly unlikely to attend the unspecialized schools that participate in the SHP or be able to respond to the questionnaire (see Kaltiala-Heino & Lindberg, 2019). For 2013 and 2015, the

category of implausible/unreliable responding could not be computed, as no similar variables were available.

Reference

Kaltiala-Heino, R., Lindberg, N., 2019. Gender identities in adolescent population: methodological issues and prevalence across age groups. *Eur. Psychiatry*, 55, 61–66.
<https://doi.org/10.1016/j.eurpsy.2018.09.003>.

Supplementary Table S1

Effects of linear time (years) and the COVID-19 pandemic outbreak (the year 2021) on generalized anxiety (GAD-7 \geq 10) among 13–20-year-old Finns between 2013–2021 in females and males. Odds ratios (OR) and 95% Confidence Intervals (95% CI) from unadjusted logistic regression analyses by age group.

	Females		Males	
	OR (95% CI)	p	OR (95% CI)	p
Total				
Time since 2013, years	1.050 (1.046–1.054)	< 0.0001	0.980*** (0.974–0.987)	< 0.0001
COVID-19 (year 2021) ¹	1.594 (1.552–1.637)	< 0.0001	1.543 (1.472–1.617)	< 0.0001
Age group 13–15 years old				
Time since 2013, years	1.037 (1.031–1.044)	< 0.0001	0.980 (0.970–0.990)	0.0001
COVID-19 (year 2021) ¹	1.700 (1.634–1.769)	< 0.0001	1.522 (1.419–1.632)	< 0.0001
Age group 16–17 years old				
Time since 2013, years	1.057### (1.051–1.064)	< 0.0001	0.979 (0.969–0.989)	< 0.0001
COVID-19 (year 2021) ¹	1.554## (1.495–1.616)	< 0.0001	1.569 (1.463–1.683)	< 0.0001
Age group 18–20 years old				
Time since 2013, years	1.075### (1.063–1.089)	< 0.0001	0.993 (0.974–1.013)	0.5129
COVID-19 (year 2021) ¹	1.351### (1.243–1.468)	< 0.0001	1.553 (1.346–1.792)	< 0.0001

¹ Coded “1” for the year 2021, otherwise “0”

*** p < 0.001—effect significantly different compared to females

p < 0.01, ### p < 0.001—effect significantly different compared to the corresponding effect in 13–15-year-olds (within sexes).

Supplementary Table S2

Effect of the COVID-19 pandemic (the year 2021) on generalized anxiety (GAD-7 \geq 10) among 13–20-year-old Finns compared to pre-pandemic levels in years 2017–2019 in females and males. Odds ratios (OR) and 95% Confidence Intervals (95% CI) from adjusted¹ logistic regression analyses by gender identity².

	Females		Males	
	OR (95% CI)	p	OR (95% CI)	p
Cisgender ³				
COVID-19 (year 2021) ⁵	1.807 (1.769–1.846)	< 0.0001	1.626 (1.560–1.695)	< 0.0001
Transgender ⁴				
COVID-19 (year 2021) ⁵	1.921 (1.777–2.077)	< 0.0001	1.656 (1.422–1.928)	< 0.0001
Gender identity x COVID-19 interaction term	1.080 (0.997–1.171)	0.0594	1.023 (0.874–1.197)	0.7801

¹ Models adjusted for age group, parental education, living with both parents, immigrant status and region.

² Data on gender identity available from the year 2017 onwards; suspected implausible/unreliable answers excluded (see methods).

³ Reported assigned sex at birth congruent with perceived gender

⁴ Comprising opposite sex and other/non-binary gender identities

⁵ Coded “1” for the year 2021, otherwise “0”

Note: In the adjusted models combining the years 2017-2021, OR of transgender identity (cisgender as the reference) on generalized anxiety was 2.820 (95% CI: 2.711–2.935; $p < 0.0001$) in females and 4.448 (95% CI: 4.128–4.792; $p < 0.0001$) in males.

Supplementary Table S3

Effects of linear time (years) and the COVID-19 pandemic outbreak (the year 2021) on generalized anxiety (GAD-7 \geq 10) among 16–20-year-old Finns between 2013–2021 in females and males. Odds ratios (OR) and their 95% Confidence Intervals (95% CI) from adjusted¹ logistic regression analyses by school level.

	Females		Males	
	OR (95% CI)	p	OR (95% CI)	p
Age group 16–17 years old				
Comprehensive school				
Time since 2013, years	1.056 ^{###} (1.043–1.070)	< 0.0001	0.985 ^{##} (0.965–1.005)	0.1330
COVID-19 (year 2021) ²	1.391 ^{##} (1.279–1.512)	< 0.0001	1.462 (1.268–1.685)	< 0.0001
General upper secondary school				
Time since 2013, years	1.079 ^{###} (1.070–1.088)	< 0.0001	1.000 ^{###} (0.984–1.017)	0.9981
COVID-19 (year 2021) ²	1.556 (1.447–1.640)	< 0.0001	1.562 (1.398–1.746)	< 0.0001
Vocational school				
Time since 2013, years	1.021 (1.008–1.034)	0.0015	0.947 (0.928–0.966)	< 0.0001
COVID-19 (year 2021) ²	1.677 (1.529–1.841)	< 0.0001	1.771 (1.531–2.049)	< 0.0001
Age group 18–20 years old				
General upper secondary school				
Time since 2013, years	1.105 ^{###} (1.086–1.124)	< 0.0001	1.043 ^{##} (1.010–1.077)	0.0094
COVID-19 (year 2021) ²	1.260 (1.130–1.405)	< 0.0001	1.442 (1.170–1.777)	0.0006
Vocational school				
Time since 2013, years	1.053 (1.034–1.073)	< 0.0001	0.973 (0.945–1.001)	0.0601
COVID-19 (year 2021) ²	1.447 (1.260–1.661)	< 0.0001	1.396 (1.110–1.755)	0.0043

¹ All models adjusted for parental education, living with both parents, immigrant status and region.

² Coded “1” for the year 2021, otherwise “0”

^{##} p < 0.01, ^{###} p < 0.001—effect significantly different compared to the corresponding effect in vocational school (within sexes).

Supplementary Table S4

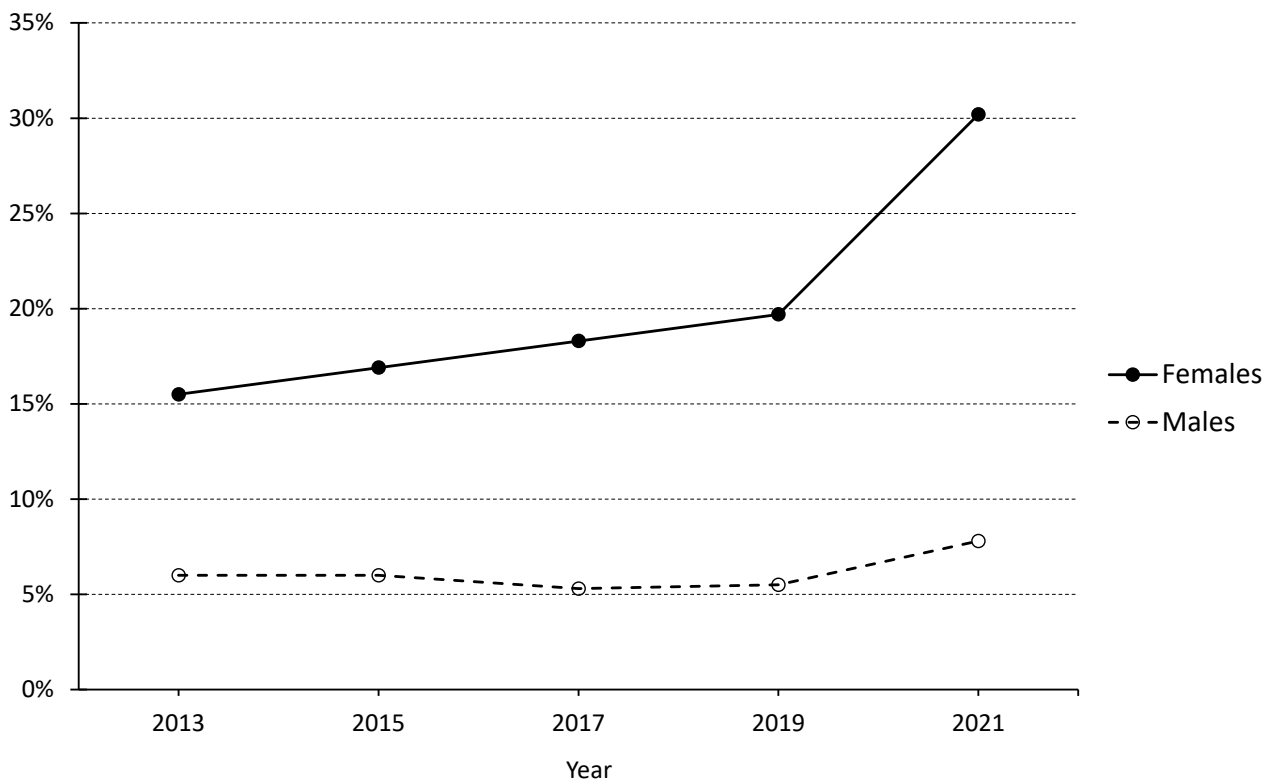
Remote learning-related measures in SHP 2021 in females and males.

	Missing data % ¹	Females (N = 83,019) ² %	Males (N = 74,159) ² %	Sex difference p
Time spent in remote learning during the school year	9.3			< 0.0001
Less than 1 month per semester		33.8	36.6	
1–2 months per semester at most		40.0	37.5	
Over 2 months in either semester		18.8	16.6	
Over 2 months in both semesters		7.4	9.4	
Support received for studies/learning while in remote education	4.1 ³			< 0.0001
Not needed/received a lot		44.2	57.4	
Received some		36.5	32.6	
Not received, would have needed		19.3	10.0	

¹ Of those participating in 2021 fulfilling the inclusion criteria for the study, excluding suspected implausible/unreliable answers (see methods), N=157728

² Suspected implausible/unreliable answers were excluded (see methods)

³ In addition, 13.4% of cases were not in remote learning and were excluded from this variable.



Supplementary Figure S1

Percentages of those with generalized anxiety ($GAD-7 \geq 10$) among 13–20-year-old Finns from 2013–2021 by sex.