Symptoms of depression and anxiety among elite high school student-athletes in Sweden during the COVID-19 pandemic: A repeated cross-sectional study

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ABSTRACT

The COVID-19 pandemic precipitated numerous changes in daily life, including the cancellation and restriction of sports globally. Because sports participation contributes positively to the development of student-athletes, restricting these activities may have led to long-term mental health changes in this population. Using a repeated cross-sectional study design, we measured rates of depression using the Patient Health Questionnaire-2 and anxiety using the Generalized Anxiety Disorder-2 scale in student-athletes attending elite sport high schools in Sweden during the second wave of the pandemic (February 2021; n = 7021) and after all restrictions were lifted (February 2022; n = 6228). Depression among student-athletes decreased from 19.8% in 2021 to 17.8% in 2022 (p = .008, V = .026), while anxiety screening did not change significantly (17.4% to 18.4%, p > .05). Comparisons between classes across years revealed older students exhibited decreases in depressive symptoms, while younger cohorts experienced increases in symptoms of anxiety from 2021 to 2022. Logistic regressions revealed that being female, reporting poorer mental health due to COVID-19, and excessive worry over one’s career in sports were significant predictors of both depression and anxiety screenings in 2022. Compared to times when sports participation was limited, the lifting of restrictions was associated with overall reduced levels of depression, but not anxiety.

Sports participation provides excellent opportunities for high school students’ physical and psychosocial development (Eime et al., 2013; Felfe et al., 2016; Guddal et al., 2019; Jewett et al., 2014). In addition to its positive impact on growth, sports participation has been demonstrated to shield student-athletes from developing depressive symptoms via numerous mediating factors, such as increased exercise, connectedness, and social support (Armstrong et al., 2015; Harvey et al., 2018). Research even suggests student-athletes are better equipped to adapt to change and cope with negative emotional states than their non-athlete peers (Acosta et al., 2021; LaForge MacKenzie et al., 2022; Parker et al., 2021). However, turbulent experiences or events that threaten to undermine the student-athlete identity and restrict physical activity can negate the positive impact student athletes have on resiliency and instead engender the development of internalizing symptoms (Graupensperger et al., 2020; Hagiwara et al., 2021; Watson et al., 2022). The coronavirus disease 2019 (COVID-19) pandemic starting March 2020 could be considered one such event. As a means of mitigating the spread of the virus, the Swedish government implemented restrictions and social distancing guidelines that led to widespread cancellations of athletic competitions and practices as well as the switch to online schooling (Bergdahl & Nouri, 2021; Ludvigsson, 2020). These abrupt and extensive changes had a significant effect on the academic, social, and leisure lives, as well as the mental health, of many people, but especially high school student-athletes who relied heavily on sports participation and classroom interaction for regular physical activity and social connection (Shepherd et al., 2021; Watson et al., 2022). A summary of key dates and events associated to COVID-19 that affected high school sports in the Swedish context is included in the Appendix.

Initial research highlighted the increased risk for adverse mental health effects among student-athletes who relied on exercise to manage stress and maintain mental health during the pandemic (Chandler et al., 2021; Grubic, Jain, Mihajlovic, Thornton, et al., 2021; Liu, 2020; T. A. McGuine, Biese, Petrovska, Hetzel, Reardon, et al., 2021; T. A. McGuine, K. M. Biese, L. Petrovska, S. J. Hetzel, C. L. Reardon, et al., 2021; McGuine, Biese, Schwarz, et al., 2022) and several studies support this hypothesis. An American cross-sectional study found that adolescent athletes who competed in an autumn term sport, which coincided with the second wave of COVID-19, were less likely to endorse symptoms of depression and anxiety, and more likely to report better quality of life than athletes who did not...
participate in an autumn sport (T. A. McGuine et al., 2022). A follow-up study by the same research group examined physical activity, depression, and quality of life in samples of adolescent student-athletes collected prior to COVID-19, during the initial wave when sporting events were mostly cancelled, and toward the end of the second wave when sports participation opportunities were made available again. Their results indicated that adolescent athletes surveyed during the first wave were more likely to endorse moderate to severe levels of depression and report poorer well-being than those before the pandemic and those surveyed towards the end of the second wave when sports resumed (McGuine, Biese, Hetzel, et al., 2022). Another study of American high school students measured changes in depressive symptoms using Patient Health Questionnaire (PHQ) scores one month before restrictions took effect, at the start of the second wave, at the start of the third wave, and at the end of the third wave. They found students surveyed at the start of the second wave had 3.7 times higher odds of endorsing higher PHQ scores than students surveyed prior to the implementation of COVID-19 restrictions (Adams et al., 2022). Although more cross-cultural research is warranted, evidence suggests the absence of sports during lockdown and restriction-heavy phases of the pandemic were associated with the worsening of mental health in adolescent student-athletes.

Researchers are becoming increasingly interested in the relationship between student-athlete “eliteness” and mental health outcomes, as high school student-athletes pursuing a career in professional sports face a unique set of stressors that impact their mental health, such as elevated performance standards, extensive travel, and an increased risk of injury, all while maintaining academic standards (Gerber et al., 2022; Kegelaers et al., 2022; Rice et al., 2016). Few studies have investigated the impact of the pandemic on this group in the context of COVID-19, but extant research indicates certain subgroups of student-athletes at the elite level were more likely to develop mental health issues during the pandemic than others. A cross-sectional study conducted in February 2021 on a sample of 7,025 Swedish elite high school student-athletes found a large proportion of these students were adversely affected by the pandemic, particularly females and team sport athletes (Håkansson et al., 2022). In addition, despite controlling for gender, age, and type of sport, they discovered excessive worry about the future of one’s sporting career was associated with moderate to severe symptoms of depression. To date, no follow-up research has been conducted to determine whether the reintroduction of sports and removal of restrictions impacted the mental health in the elite high school athlete demographic.

The purpose of this study was to examine longitudinal changes in the mental health of elite high school student-athletes during two distinct phases of the pandemic. More specifically, using student-athlete health data collected in 2021 and 2022, we sought to (1) compare overall prevalence rates and symptom severity of depression and anxiety across years, (2) assess cohort and class-level differences on internalizing measures, and (3) identify demographic and health risk factors for developing depressive and anxiety symptoms in 2022 and compare the composition of these models predicting depression and anxiety with those proposed by Håkansson et al. (2022) (Håkansson et al., 2022) on student-athletes in the 2021 sample. First, we hypothesized depression and anxiety prevalence rates would decline from COVID-19-affected 2021 to the return to normalcy in 2022 (e.g., resuming of sports, in-person schooling, etc.) both overall and among each student-athlete cohort. In addition, we hypothesized students’ school class, gender, sport type, level of career worry, and perception of mental health change related to the pandemic would be significant predictors of depression and anxiety disorder screening positively, which would mirror the composition of the models described by Håkansson et al. (2022) (Håkansson et al., 2022) for 2021 participants.

Methods and materials

Participants

The present epidemiological study employed a cross-sectional design that was repeated in 2021 and 2022, with an anonymous online survey administered to a total of 8,441 elite sports-focused high school students in 2021 and 8,189 in 2022. The objective of these specialized high schools is to prepare student-athletes for careers as professional athletes while adhering to a standard high school curriculum. Approximately 1,200 student elite athletes are admitted to national level programs, while another 10,000 enroll in programs at the regional and local levels. As the same population of student-athletes was surveyed on both occasions, participant overlap is anticipated. As mentioned, the student-athlete data from 2021 were the same as those used by Håkansson and colleagues (2022).

Materials and procedures

The primary survey, administered annually by the Swedish Sports Confederation in February, collects basic demographic information from student-athletes and assesses student well-being and satisfaction with their sport participation. For the purposes of the present study, a section measuring psychiatric health was added but only presented to participants who consented to complete this section. Table 1A of the Appendix illustrates how drastically different the two time periods were when each survey was administered. In February 2021, there were a number of governmental restrictions in effect. For example, sports practices for non-professional athletes ages 15 and older, including participants in the present study, were limited to no more than eight participants per session at the time. In contrast, all COVID-19 restrictions had been lifted by the time the survey was administered in February of 2022 (Ministry of Health and Social Affairs [Socialdepartementet], 2022). The Swedish Ethics Review Authority reviewed this study (file number 2020–07246) and concluded that data collected in the present study could not be used to identify a specific individual, and hence did not necessitate formal ethical approval.
Variables

Demographics

Demographic variables included sex, sport, and school year as a proxy for age. Sport was transformed into two binary variables: team versus individual sport and winter versus non-winter sport. Sports considered team sports included ice hockey, soccer, handball, floorball, bandy, volleyball, basketball, team gymnastics, rugby, football, and curling. Despite the existence of sports with both individual and team competitions, sports primarily played individually were coded as such (tennis, etc.). Sports were considered winter sports if the competitive season for this age group spanned from October to March, as the COVID-19 restrictions in place likely impacted a greater portion of the season for these sports than other sports beginning earlier or extending later into the spring. For example, floorball athletes often compete over the winter months and may have been affected by restrictions and surging cases, but their seasons begin in early September and thus were able to compete for part of a season. Winter sports included ice hockey, bandy, curling, figure skating, and sports involving skiing. Three participants who selected sports for the deaf as their sport were coded as individual and non-winter sports participants. Analyses were conducted with school year as both an ordinal variable and a continuous variable.

Psychological health

We administered the Swedish two-item short forms of the PHQ-2 (Kroenke et al, 2003) and Generalized Anxiety Disorder (Kroenke et al, 2007) (GAD-2) instruments to measure depression and anxiety, respectively. While the long forms for each respective questionnaire were administered in 2021, only the short forms were administered in 2022; consequently, only the two corresponding items from 2021 were considered. The short forms of both questionnaires have been validated in student-athlete samples (LoGalbo et al., 2022; Tran, 2020) and were demonstrated to have adequate sensitivity and specificity (Kroenke et al., 2003, 2007; LoGalbo et al., 2022; Plummer et al., 2016; Tran, 2020) with scores ≥ 3 for both scales indicating moderate or severe levels of depression and anxiety, respectively. To measure career worry and changes in mental health specifically related to the COVID-19 pandemic, two items were posed, “Are you worried about your own career in sports in relation to the present crisis?” (I have lost motivation and considered quitting, very worried, a little worried, indifferent, not worried), and “Has your psychological health changed since the beginning of the COVID-19 crisis?” (much worse, worse, unchanged, improvement), both adapted from Håkansson et al. (2020) (Håkansson et al., 2020).

Statistical methods

Between 2021 and 2022, demographic and experimental variables were compared utilizing Chi-square tests for categorical variables, independent-samples t-tests for continuous variables, and Mann-Whitney U tests for ordinal variables. Additional Chi-square tests were conducted to measure changes over time as cohorts (Cohort 1 included students in year 1 in 2021 and year 2 in 2022, Cohort 2 included students in year 2 in 2021 and year 3 in 2022, and Cohort 3 included students in year 3 in 2021 and year 4 in 2022) and as school classes (e.g., year 1 students 2021 versus year 1 students 2022, etc.). Benjamini and Hochberg (1995) (Benjamini & Hochberg, 1995) corrections were made to account for multiple testing, and therefore p-values <.05 were deemed significant for these analyses. Next, binary logistic regressions were conducted on 2022 PHQ-2 and GAD-2 screenings, with demographic variables, self-reported change in mental health, and self-reported worry about sporting career entered as predictors. Using Bonferroni-adjusted alpha levels, p-values <.0045 were deemed significant for predictors. Career worry and health change were treated as ordinal predictors because of the Likert nature of these items. R-V4.2.1 was used to conduct all analyses.

Results

Demographics

In 2021 and 2022, 8441 and 8189 respondents consented to participate in the main survey, respectively. Of these, 7434 (88.1%) and 6801 (83.1%) participants consented to answer psychiatric health-related questions, for which data for these variables were missing from 5.2–5.7% of participants in 2021 and 8.2–8.7% of participants in 2022. A total of 413 participants who consented in 2021 but did not respond to at least 50 percent of questions in this section were omitted from further analysis, leaving a total of 7021 participants. Likewise, 573 consenting participants in 2022 failed to answer more than 50 percent of questions in this section, leaving a total of 6228 participants. Data were missing across variables from < 1% of each sample after exclusion. Missing values were imputed using multivariate imputation by chained equations for ordinal variables with proportional odds logistic regression models using five iterations of the polr function of the mice() package. Analyses were conducted using each generated dataset. Results did not differ significantly and therefore the summary statistics reported are derived from one of the five generated datasets.

In 2021, participants represented a vast range of sports with soccer (25%), handball (15%), floorball (13%), golf (4%), cross country skiing (4%), and track and field (3%) being amongst the most popular among students. In 2022, participants represented similar sports albeit in different proportions, with soccer (28%), floorball (13%), basketball (7%), golf (5%), and handball (5%) being most popular. Aggregated demographic characteristics are presented in Table 1 across 2021 and 2022. After adjusting for multiple comparison, the proportion of participants representing team sports was greater in 2021 than 2022, χ²(1) = 42.84, p_adj<.001, V=.057. The number of students representing each class, χ²(3) = 7.566, p_adj=.10, V=.024, and proportion of males to females did not differ, χ²(2) = 3.580, p_adj=.10, V=.016. Year four students were fewer in comparison to year 1–
3 students because year four students opted for a slower study pace, in contrast to completing school after 3 years at a normal study pace.

**Psychological health 2021 to 2022**

In 2021, 19.8% of participants screened positive for depression (PHQ ≥3), as opposed to 17.8% in 2022, a significant decrease in depression prevalence across years, χ²(1) = 8.944, p_adj = .008, V = .026. As expected, this was accompanied by a significant decrease in mean PHQ scores from 2021 (M_{2021} = 1.38 ± 1.52) to 2022 (M_{2022} = 1.25 ± 1.48), t(13131) = 5.188, p_adj < .001, d = .087. School class-level analyses revealed significant differences in the prevalence of PHQ positive screenings between 2021 and 2022. Year 1 students in 2021 (17.6%) and 2022 (18.3%) did not differ, χ²(1) = .321, p_adj = .68, V = .008, neither did year 2 students in 2021 (19.5%) and 2022 (17.6%), χ²(1) = 2.799, p_adj = .15, V = .025. However, year 3 students in 2021 (22.7%) differed from year 3 students in 2022 (18.0%), χ²(1) = 12.656, p_adj = .001, V = .059, and year 4 students in 2021 (24.0%) differed from year 4 students in 2022 (12.8%), χ²(1) = 8.412, p_adj = .009, V = .145. Rates of athletes screening positive for anxiety disorders (GAD ≥3) did not significantly differ between 2021 (17.4%) and 2022 (18.4%), χ²(1) = 2.357, p_adj = .18, V = .013, and the same lack of effect was found for GAD mean scores for 2021 (M_{2021} = 1.35 ± 1.57) versus 2022 (M_{2022} = 1.36 ± 1.59), t(13013) = -0.274, p_adj = .84, d = .006.

Specific to COVID-19’s impact on mental health, fewer participants reported worsening mental health due to COVID-19 in 2022 than in 2021, with true median locations significantly differing between 2021 (Mdn = 3[Worse]) and 2022 (Mdn = 2[Unchanged]), U = 17928438, p_adj < .001, r = -.0169. Likewise, significantly fewer participants reported pandemic-induced worry over their sports career in 2022 compared to 2021 (Mdn = 2[Indifferent]) and 2022 (Mdn = 2 [Indifferent]), U = 17549984, p_adj < .001, r = -0.178. Results are summarized in Table 2.

Cohort-level analyses revealed significant differences in PHQ positive screenings across years. The prevalence of depression did not differ between year 1 students in 2021 (17.6%) and year 2 students in 2022 (17.6%), χ²(1) = .001, p_adj = .98, V < .001, neither between year 2 students in 2021 (19.5%) and year 3 students in 2022 (17.9%), χ²(1) = 1.735, p_adj = .26, V = .020, but year 3 students in 2021 (22.6%) differed from year 4 students in 2022 (12.8%), χ²(1) = 10.125, p_adj = .004, V = .070. The prevalence of positive GAD screenings across cohorts differed over time as illustrated in Figure 1. There were significant differences in anxiety between year 1 students in 2021 (15.4%) and year 2 students in 2022 (19.2%), χ²(1) = 12.016, p_adj = .002, V = .051, as well as between year 2 students in 2021 (17.4%) and year 3 students

### Table 1. Student athlete demographics 2021–2022.

<table>
<thead>
<tr>
<th>Variable</th>
<th>2021 (n = 7021)</th>
<th>2022 (n = 6228)</th>
<th>p_{raw}</th>
<th>p_{adj}</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2505 (35.7%)</td>
<td>2165 (34.8%)</td>
<td>.056</td>
<td>.101</td>
</tr>
<tr>
<td>2</td>
<td>2438 (34.7%)</td>
<td>2081 (33.4%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1874 (26.7%)</td>
<td>1785 (28.7%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>204 (2.9%)</td>
<td>197 (3.2%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex (Female)</td>
<td>3034 (43.2%)</td>
<td>2589 (41.6%)</td>
<td>.059</td>
<td>.101</td>
</tr>
<tr>
<td>Team Sport</td>
<td>4717 (67.2%)</td>
<td>3844 (61.7%)</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>


### Table 2. Depression, anxiety, and COVID-19 impact on mental health 2021–2022.

<table>
<thead>
<tr>
<th>Variable</th>
<th>2021</th>
<th>2022</th>
<th>p_{raw}</th>
<th>p_{adj}</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive diagnosis, n (%)a</td>
<td>1390 (19.8%)</td>
<td>1107 (17.8%)</td>
<td>.002</td>
<td>.007</td>
</tr>
<tr>
<td>PHQ-2 ≥ 3</td>
<td>1219 (17.4%)</td>
<td>1114 (18.4%)</td>
<td>.125</td>
<td>.187</td>
</tr>
<tr>
<td>GAD-2 ≥ 3</td>
<td>1.35 (1.57)</td>
<td>1.36 (1.59)</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Symptom measure M (SD)b</td>
<td>2065 (29.4%)</td>
<td>3010 (48.3%)</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Improvement</td>
<td>332 (4.7%)</td>
<td>261 (4.2%)</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Unchanged</td>
<td>3736 (53.2%)</td>
<td>2452 (39.4%)</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Worse</td>
<td>888 (12.6%)</td>
<td>505 (8.1%)</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Worry about sporting career due to COVID-19, n (%)c</td>
<td>159 (2.3%)</td>
<td>284 (4.6%)</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Lost motivation and considered quitting sport</td>
<td>159 (2.3%)</td>
<td>284 (4.6%)</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Very worried</td>
<td>567 (8.1%)</td>
<td>205 (3.3%)</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>A little worried</td>
<td>2509 (35.7%)</td>
<td>1178 (18.9%)</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Indifferent</td>
<td>1980 (28.2%)</td>
<td>2209 (35.5%)</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Not worried</td>
<td>1806 (25.7%)</td>
<td>2352 (37.8%)</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>


aChi-square test of homogeneity.

bIndependent-samples t-test.

cMann-Whitney U test.
in 2022 (20.5%), \( \chi^2(1) = 6.307, \rho_{adj} = .025, V = .039 \). The prevalence of anxiety did not differ between year 3 students in 2021 (19.8%) and year 4 students in 2022 (16.3%), \( \chi^2(1) = 1.379, \rho_{adj} = .30, V = .026 \). Across cohorts, participants in cohort 3 were more likely to screen positively for depression than cohorts 1 and 2. Results are illustrated in Figure 1.

**Predicting depression and anxiety screenings in 2022**

Binary logistic regressions were conducted to assess the effects of demographic and health variables on the likelihood participants screened positive for depression and anxiety on PHQ-2 and GAD-2 scales, respectively. Of the eleven predictors for depression, five were statistically significant. Females had 1.50 times higher odds to screen positive for depression than males, OR = 1.50, 95% CI [1.31,1.73], \( p < .001 \). Athletes reporting much worse mental health due to COVID-19 had 2.94 times higher odds to screen positively than those reporting improvement, OR = 2.94, 95% CI [2.06,4.21], \( p < .001 \). Those considering quitting sport were 1.90 times more likely to screen positive for depression than those reporting they were unworried about their career in sports, OR = 1.90, 95% CI [1.40,2.54]. Those reporting their health was unaffected by pandemic-related changes had 0.45 times the odds to screen positive than those reporting improved mental health, OR = 0.45, 95% CI [0.33,0.62], \( p < .001 \). Lastly, increasing year in school was associated with having 0.82 times the odds of screening positive for depression, OR = 0.82, 95% CI [0.76,0.89], \( p < .001 \).

Of the eleven predictors for anxiety, seven were significant. Females had 2.73 times higher odds to screen positively for anxiety than males, OR = 2.73, 95% CI [2.37,3.16], \( p < .001 \). Athletes reporting much worse mental health due to COVID-19 had 3.37 times higher odds, OR = 3.37, 95% CI [2.33,4.91], \( p < .001 \), while those endorsing no change had 0.39 the odds of screening positively for anxiety when compared to those reporting improvements in mental health, OR = 0.39, 95% CI [0.28,0.55], \( p < .001 \). Regarding their career in sports, those reporting they were very worried had 2.11 higher odds, OR = 2.11, 95% CI [1.49,2.98], \( p < .001 \), those considering quitting had 1.90 higher odds, OR = 1.90, 95% CI [1.38,2.57], \( p < .001 \), those reporting they were a little worried had 1.92 high odds, OR = 1.92, 95% CI [1.57,2.32], \( p < .001 \), and those reporting they were indifferent had 1.62 higher odds than those reporting they were unworried about their sporting careers to screen positively for anxiety, OR = 1.62, 95% CI [1.36,1.94], \( p < .001 \). Odds ratios with 95% confidence intervals are plotted in Figure 2.

**Discussion**

Regular physical activity, social connection, and social support are important protective factors mediating the relationship between high school sports participation and the onset of internalizing symptoms such as depression and anxiety in adolescents (Armstrong et al., 2015; Harvey et al., 2018; Panza et al., 2020). During the COVID-19 pandemic, however, cancellations and restrictions on high school student-athlete sports were common, which may have curtailed this protective effect by limiting physical exercise and disrupting social connection and social support, and thus worsening mental health (Hagiwara et al., 2021; Parker et al., 2021; Shepherd et al., 2021; Watson et al., 2022). With the reintroduction of sports during the later phases of the pandemic, the benefits of sports participation...
were hypothesized to have a positive impact on student-athletes once again (Adams et al., 2022; McGuine, Biese, Hetzel, et al., 2022; T. A. McGuine et al., 2022). Accordingly, the present study was conducted to assess changes in depression and anxiety prevalence among elite student-athletes between February 2021 when sports were cancelled or restricted versus February 2022 when sports once again proceeded unrestricted. The present study also aimed to identify risk factors for depression and anxiety in 2022, and finally to compare these models to those of Håkansson and colleagues (2022) (Håkansson et al., 2022). In the present study with 13,249 observations across two years, the overall depression rate decreased by 2.0% from 2021 to 2022, while anxiety rates did not differ significantly from year to year. Correspondingly, scores for depressive symptoms on the PHQ-2 decreased significantly, while scores for anxiety symptoms on the GAD-2 remained stable from 2021 to 2022. These findings lend partial support to our first hypothesis postulating that depression and anxiety prevalence rates generally would decrease in 2022, when student-athletes were no longer limited in their ability to practice and compete. These changes are consistent with studies indicating that sports participation shield student-athletes from developing depressive symptoms, but not symptoms of anxiety (Harvey et al., 2018). Analyses at the cohort-level revealed changes in prevalence rates dependent on the cohort measured, as depression rates decreased for cohort 3 while anxiety rates increased for cohorts 1 and 2 from 2021 to 2022. Decreased levels of depression among third year students entering their final year in 2022 are consistent with findings from other studies (T. A. McGuine, Biese, Petrovska, Hetzel, Reardon, et al., 2021). This indicates that the reintroduction of sports had a greater positive impact on older students nearing the end of their developmental period than on other cohorts. Perhaps striking for some, the prevalence of anxiety increased among younger cohorts following COVID-19, which contradicts findings seen in similar samples (T. A. McGuine et al., 2022). Increased rates among cohorts 1 and 2 May be due to increased anxiety as students progress through more advanced stages of the school curriculum, but they may also indicate that anxiety levels remained elevated above those observed prior to the pandemic or that returning to an environment with unique stressors may have triggered the development of symptoms. Finally, although not central to our purpose, the proportion of student-athletes considering quitting between 2021 and 2022 doubled. Given that considering quitting was associated with greater odds of screening positive for both depression and anxiety, it is possible that the pandemic’s combination of identity-threat, deconditioning, cancelled major tournaments and competitions, as well as poorer mental health drove aspiring student-athletes away from pursuing a professional career in sports. This outcome merits further attention and investigation.

When generating models to predict screenings for depression, females, students reporting their mental health was much worse off because of the pandemic, and those reporting their level of worry was to the point where they considered quitting sport, were more likely to screen positively. The opposite was true for upperclassmen and those who said their mental health
had not changed as a result of the pandemic. These results largely corroborate our hypothesis that these factors would predict depression; however, the fact older classes were less likely to screen positively ran counter to our expectations and previous findings (Håkansson et al., 2022). This may be indicative of the resilience of third year students in 2021, as they may adapted well to the pandemic’s challenges by the time they entered their final year in 2022. Furthermore, type of sport, both individual versus team and winter versus non-winter sports, were not significant factors for students in 2022. These findings reflect the significance of pandemic-related changes on winter and team sport athletes in 2021 and demonstrate that residual COVID-19-related effects are minimal but may have taken on another manifestation, as participants reported less concern over their sporting careers and less COVID-19 impact on mental health in 2022.

In sum, some of our findings are consistent with research showing student-athlete populations were at an elevated risk for deteriorating mental health during the pandemic, certain subgroups were more severely affected than others, and the reintroduction of sporting opportunities would be associated with improved mental health outcomes in this population (Chandler et al., 2021; Grubic, Jain, Mihajlovic, Thornton, et al., 2021; Liu, 2020; McGuine, Biese, Hetzel, et al., 2022; T. A. McGuine et al., 2022). In addition, our findings support the positive effects sports participation has on the health of adolescents; however, a causal relationship cannot be established due to the nature of our study design. This study has several practical ramifications to addressing mental health concerns in elite student-athlete populations in response to the current and future crises. Presently, interventions aimed at addressing anxiety among certain subgroups, namely younger female cohorts considering quitting, are of importance. Tertiary prevention strategies at the level of the individual, academic institution, and sport organization, will be optimal to address the needs among these subgroups (see Grubic et al. (Grubic, Jain, Mihajlovic, Thornton, et al., 2021) for specific recommendations). In addition, stakeholders should target the need for adaptability when regulating high school sports in response to circumstances that necessitate restrictions. Together with other research, ours demonstrates that maintaining opportunities for high school students to engage in sports, if deemed safe in a given context, should be prioritized.

**Strength and limitations**

The large and generally homogenous samples of student-athletes recruited across 50 sports from all elite sport high schools in Sweden is a major strength of the current study. Thus, we could better control for important covariates related to the development of internalizing symptoms and generate more robust models of depression and anxiety in this population over time. Nonetheless, this investigation was not without limitations. First, we were unable to conduct adequate within-subject comparisons across years and assess causality due to the anonymity of the data and the cross-sectional nature of the study design. An analysis strategy using chi-square tests to circumvent the requirement for paired data may produce spurious results (Adedokun & Burgess, 2012) and therefore within-subject results need to be interpreted with caution. Due to the lack of a pre-COVID-19 baseline, we cannot rule out the possibility that, despite significant reductions, depression rates among this group of elite high school student-athletes did not return to pre-COVID-19 baseline levels, or that anxiety rates remained stable throughout the pandemic. Similarly, we cannot conclude with certainty the observed changes between 2021 and 2022 were caused by factors such as the return of sports and the removal of sports-related restrictions or other extraneous factors like the removal of overall restrictions or the impact of more widespread vaccination. Although we cannot account for all of these confounding variables, the timing of the survey administration provides a near-perfect snapshot of the period between the peak and end of the COVID-19 pandemic, allowing us to draw conclusions based on the accumulation of all related changes.

Second, in consideration of the length of the survey, we selected the brief PHQ and GAD instruments to screen for depression and anxiety. Although these scales have demonstrated adequate sensitivity in screening adolescent student-athlete populations (Byrd-Bredbenner et al., 2021; LoGalbo et al., 2022; Tran, 2020) the longer forms would have yielded more reliable results. The PHQ-2 and GAD-2 items each measure hallmark symptoms of depression and anxiety, respectively; however, these disorders are more comprehensive than the short-forms suggest. Because items addressing other key symptoms were excluded, participants exhibiting these symptoms were likely underrepresented. Similarly, because these symptoms are self-reported, we cannot assume screenings for depressive and anxiety disorders represent true prevalence rates in this population.

Third, survey-based studies, such as this one, that require participants to recall previous events or self-report health history are susceptible to misclassification and recall bias. Based on their current condition, participants may have been more likely to overestimate or underestimate their previous health status. Similarly, our sample may be subject to volunteer bias, as those with poorer mental health may not have participated in the survey or were more likely to withdraw than healthy participants.

Finally, the generalizability of our findings is challenged by the uniqueness of Sweden’s response to the COVID-19 pandemic and the elite nature of our student-athlete sample. The cancellation of domestic sporting and competitive events in the spring of 2020 and the implementation of restrictions in the spring of 2021 mirrored actions taken by other governments, but the Swedish government never implemented lockdown measures. Restaurants, gyms, and grocery stores remained open to the public. Nonetheless, the transition to online education and the cancellation of sporting events likely required similar adaptations by our sample and elite student-athletes in other countries. Regarding the elite nature of our sample, aspiring professional athletes may be exposed to unique stressors that can negatively impact their mental health to a greater degree than peers not pursuing a career in sports (Gerber et al., 2022; Kegelaers et al., 2022; Rice et al., 2016). However, mental health outcomes among athletes aspiring to become professionals have been shown to
be similar to those not pursuing a career in sports (Gerber et al., 2022). Therefore, we contend our findings may be generalizable to both elite and non-elite adolescent athlete populations.

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**References**


## Table A1. Governmental actions in response to COVID-19 affecting Swedish high school sports.

<table>
<thead>
<tr>
<th>COVID-19 Wave</th>
<th>Date (Spring 2020)</th>
<th>Event(s)</th>
<th>Effect on Student-Athletes</th>
</tr>
</thead>
</table>
| Wave 1        | April 1<sup>st</sup> June 14<sup>th</sup> | - Practices and competitions for adults born 2001 or later cancelled; youth sports recommended to be rescheduled for later date; youth practices recommended to take place outdoors if possible  
- Competition for all levels without spectators permitted outdoors  
- Practices for 16+ permitted to take place under safe conditions; fewer than eight participants, preferably outdoors; competitions for children permitted (National Sports Confederation [Riksidrottsförbundet], 2021)  
- Young adults 16–29 years old permitted to partake in organized indoor and outdoor sports  
- Competitions under elite level not permitted; exception for children 16 years or younger rescinded  
- One outdoor competition per week permitted for children born 2002 or later  
- Restrictions eased; competitions for children permitted; competitions for adults outdoors permitted; outdoor spectator limit increased to 500, 150 for competitions taking place in the forest, water, or street  
- Limit for number of participants for indoor activities raised to 50, 300 if seating with social distancing possible; limit for number of participants for outdoor activities raised to 600, 3000 if seating with social distancing possible; outdoor competitions subject to above changes only in start and finish areas; limit for number of competitors raised to 900  
- Most restrictions, along with restriction on number of spectators, are lifted | unable to compete nor practice, unable to meet team  
- able to compete again  
- unable to compete, unable to practice in large groups  
- permitted to compete again  
- unable to compete  
- may compete sparingly  
- indoor competition not permitted  
- able to compete again indoors in small groups |

<table>
<thead>
<tr>
<th>Wave 2</th>
<th>December 14&lt;sup&gt;th&lt;/sup&gt; February 6&lt;sup&gt;th&lt;/sup&gt; February 24&lt;sup&gt;th&lt;/sup&gt; April 28&lt;sup&gt;th&lt;/sup&gt; June 1&lt;sup&gt;st&lt;/sup&gt; July 1&lt;sup&gt;st&lt;/sup&gt;</th>
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<td>Wave 3</td>
<td>February 9&lt;sup&gt;th&lt;/sup&gt;</td>
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<td></td>
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</table>

Note. Unless otherwise cited, governmental decisions and measures referenced directly from Office of the Government’s webpage dedicated to reporting decisions impacting sport (The Government Office [Regeringskansliet], 2022).