

NORTH AMERICAN HIGH SCHOOL STUDENT-ATHLETES AND COVID-19: A PILOT STUDY

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How to cite this article: Ross, M., & DeBeliso, M. (December 2021). North American high school student-athletes and CoVid-19: A pilot study. Journal of Physical Education Research, Volume 8, Issue IV, 01-11.

Received: November 10, 2021

Accepted: December 20, 2021

ABSTRACT

The COVID-19 pandemic caused a halt in sports worldwide and is still having an impact on sports since they have resumed. High School student athletes are one of the populations that have been impacted by this pandemic. It is important to understand how the shutdown period and the ongoing challenges of the pandemic have mentally and physically affected this population. This will help ensure that their needs are met, and their health is protected. This study aimed to assess the impact of COVID-19 on high school student athletes. In March 2021, an online Google Forms survey was posted to social media (Facebook and Instagram) and was available for a week. Participants had to be high school athletes who participated in high school sports during the 2020-2021 academic year. The survey consisted of 21 multiple choice questions. Over the course of a week, there were 23 responses to the survey. Twenty-two respondents completed the survey, with 10 (45.5%) males and 12 (54.5%) females. Approximately 90.9% had important competitions or meets canceled due to the shutdown. During the shutdown, 81.8% reported feeling isolated and 86.4% reported experiencing anxiety, depression, or frustration. During the shutdown, 72.7% reported being worried about losses in fitness, falling behind in physical preparedness, and/or of having a competitive disadvantage. Approximately 59% believed they would be able to return to their previous fitness levels, while 18.2% feared getting COVID-19. Under current guidelines, 36.4% have had to quarantine since returning to sports. Of these athletes, 75% experienced anxiety, depression, or frustration; 87.5% feared falling behind teammates or competition. The COVID-19 pandemic was and continues to be a challenging time for high school athletes. Findings of this study suggest that this age group is more stressed about the impact of COVID-19 on their sport's participation than the possibility of getting sick with COVID-19. This age group could use additional mental health support to protect their mental health and wellbeing. Fear of COVID-19 does not appear to be a major stressor but being removed from regular sports participation does. During a time of quarantine, they should be provided with more virtual training that is adapted to the home environment to help maintain fitness and technical skill levels.

Keywords: COVID-19, sport, athlete, student, training, mental health, lockdown.

1. INTRODUCTION

In December of 2019, an outbreak of Coronavirus 19 (COVID-19) started in China (Novel coronavirus – China, 2020). On March 11, 2020, the World Health Organization declared COVID-19 to be a global pandemic (Groeneveld, Mathews, & Utah Division of Emergency Management, 2020). COVID-19 affects the respiratory system and has a variety of symptoms which includes fever or chills, cough, shortness of breath, fatigue, body aches, headache, loss of taste or smell, sore throat, congestion, nausea, and diarrhea (CDC, 2021). Individuals with serious underlying conditions such as diabetes, heart disease, or lung disease are more likely

to develop complications that are more serious due to COVID-19 (CDC, 2021). In response to the outbreak, many countries issued stay at home orders or lockdowns. This caused a disruption to many aspects of life including businesses being closed, public areas being closed, schools closing, and sports being halted worldwide, including the Olympics being postponed for the first time in the modern history of the event (Liu, 2020). The lockdowns, closures, and shutdown of sports had an impact on the daily lives, mental health, and physical health/fitness of people around the world (Liu, 2020; Wang et al., 2020; Sevene et al., 2020; Dauty, Menu, & Fouasson-Chailloux, 2020).

Mental health in the general population was impacted by the pandemic. In China, a majority of respondents to a questionnaire were reported to have a mild (21.4%) or moderate to severe (53.8%) psychological impact due to the pandemic (Wang et al., 2020). In another study conducted in India, 53.3% of participants were worried, 43% were anxious, 33% felt sad, and 14% felt that their lives had been completely disrupted by the pandemic (Singh et al., 2020). Factors such as some COVID-19 symptoms (sore throat, chills, and cough), a history of chronic illness, and dissatisfaction in the amount of available information about COVID-19 were found to be positively associated with a higher psychological impact (Wang et al., 2020). Getting a fever, cough, or sore throat are the most common symptoms that people were worried about experiencing (Singh et al., 2020). Adolescents also experienced symptoms of anxiety and depression during the shutdown period (Xie et al, 2020). Factors that are associated with increased depression and anxiety scores among adolescents include being worried about the effect of COVID-19, and not being optimistic about the pandemic (Xie et al, 2020).

Participating in physical activity has an impact on mental health (Sevene et al., 2020). The physical activity among the general public was found to decrease during the shutdown period of the pandemic and the decrease in physical activity was associated with a degradation in psychological well-being (Maugeri et al., 2020). A study done with professional athletes found a relationship between physical activity and depression, anxiety, and stress to be a significant negative correlation (Şenışık, Denerel, Köyağasıoğlu, & Tunç, 2020). Participating in physical activity is an important part of health both physically and mentally. The amount of physical activity in the general population and among athletes did decrease during the shutdown period and did have an impact on mental health (Maugeri et al., 2020; Şenışık, Denerel, Köyağasıoğlu, & Tunç, 2020).

For HS athletes the pandemic caused school to be moved to online environments and led to sports practices and competitions being cancelled, isolating them to their homes (Xie et al, 2020; Giannopoulou et al., 2021; Asanov et al., 2021). The closures, cancellations, and postponements due to the pandemic have caused uncertainty, stress, and anxiety (Nanaki, 2020). The mental health of high school students has also been impacted. Depression was found to be increased among high school students (Giannopoulou et al., 2021; Asanov et al., 2021), with anxiety also being found to be increased during the shutdown amongst this age group (Giannopoulou et al., 2021). Over the course of a week, the rate of depression symptoms ranged from 39.6% to 64% and the rate of anxiety ranged from 34.1% to 50% in a group of high school students (Zhou et al., 2020). Another study reported an increase from 48.5% pre shutdown to 63.8% during shutdown for depression and from 28.3% pre shutdown to 49.5% during shutdown for anxiety among HS students (Asanov et al., 2021). High school aged females were found to have higher rates of depression and anxiety than males (Giannopoulou et al., 2021, Asanov et al., 2021). Schooling and social isolation were common sources of worry among HS students, with a small amount being concerned about finances (Asanov et al., 2021). Being in a higher grade in HS is also associated with increased symptoms of depression and anxiety, while being more knowledgeable about COVID-19, its trends, and prevention are associated with lower depression and anxiety symptoms (Zhou et al., 2020).

With the COVID-19 shutdown of sports, HS athletes have less or no access to normal training facilities, coaches, and teammates. These circumstances could have led to a decrease in the time spent training and in the intensity of training or lead to a complete cessation in training. Reductions in or a cessation of training leads to detraining. This can affect performance aspects such as Vo2max, speed, and power (Koundourakis et al., 2014;), and body composition including weight and body fat percentage (Koundourakis et al., 2014; Melchiorri et al., 2014). These changes can start occurring in as little as 2 weeks (Rodríguez-Fernández et al., 2018). It has been reported that the amount of training did decrease in athletes. In one study the amount of young adult athletes training 5-6 days a week decreased from 79% to 45.7; this included a reduction in all forms of training (Jagim et al, 2020). Reductions in training could have impacted mental health due to a reduction in physical activity and could have been a source of stress and worry because of the affect a reduction in training could have on an athlete's sport. One study among professional athletes reported that 71% of participants felt that their performance would be negatively impacted by the pandemic when they returned to sports (Şenışık et al., 2020). Some major stressors that have been reported by high-level athletes due to COVID-19 are uncertainty about the future, decreased income, changed teaching methods, training facilities being unavailable, and season/competitions being cancelled (Simons et al., 2021).

In May of 2020, it was announced that schools would reopen in August and sports were allowed to resume competition (Groeneveld, Mathews, & Utah Division of Emergency Management, 2020). With the pandemic still ongoing, sports participation is still being impacted. Those that are exposed to or contract COVID-19 will have to quarantine. This leads to the possibility of one person participating on a team being isolated or to the entire team having to isolate, and once again being in a situation that could affect mental health and physical fitness. The impact of COVID-19 could have long term effects (Sevene et al., 2020). Understanding the mental and physical impact of COVID-19 on high school athletes is important, to ensure their needs are met and their health is protected. In this study we aimed to assess the impact of COVID-19 on high school student athletes. We assessed how the shutdown period affected them and how the pandemic is currently affecting them athletically and emotionally.

2. METHODS AND MATERIALS

2.1 Participants

The sample population for this study was current high school students who had participated in high school sports during the current academic year of 2020-2021. Participation was voluntary and an informed consent form was at the beginning of the survey. Recruitment of participants was done through the social media platforms Facebook and Instagram. The study was approved by a University IRB committee (IRB approval: #16-022021a).

2.2 Instruments and Apparatus

An online Google Forms Survey was used to question participants. The survey asked participants what grade, gender, type of sport they play (team or individual), team level, and what their weekly training hours were prior to the shutdown. They were then asked about the shutdown period which included questions on how their sport was impacted such as if competitions or meets were cancelled, weekly hours spent training, and if they received virtual training. They were then asked about the mental impact of the shutdown which included if they felt isolated, if they experienced anxiety, depression, or frustration, if they had a lack of initiative, if they were worried about losing fitness, and if they were worried

about how the shutdown would impact the next season. Participants were then asked about the ongoing impact of COVID-19 which included: if they fear getting COVID-19, if they have had to quarantine since returning to sports and how that impacted them mentally, if they believe they have returned to previous fitness levels, and if they fear sports being shut down again.

2.3 Procedures

On March 13, 2021, the Google Forms Survey was posted on Facebook and Instagram with information about the purpose of the study, the inclusion criteria, and how long the survey would be available for. The survey remained available for a week.

2.4 Design

Descriptive statistics were used to analyze the data. Counts and percentages were calculated based on the number of responses received for each answer per questions on the survey.

3. RESULTS

There were 23 respondents to the survey with 22 of these individuals completing the survey over the course of a week. Only the completed surveys were included in the results. The characteristics of the participants can be found in Table 1. Most respondents were seniors (40.9%) and the least amount of respondents were freshman (4.5%), with 45.5% of respondents being male and 54.5% being female. Most respondents were participating in individual sports (54.5%), with the majority (80%) of male athletes being individual sport athletes and the majority (66.7%) of female athletes being team sports athletes. For team level most participants were competing at the varsity level (54.5%) followed by junior varsity (36.4%), and the least competing at the freshman/sophomore level (9.1%). The majority of participants reported training for less than 15 hours a week prior to the COVID-19 shutdown (50%) with the next highest number of hours spent training being 15-20 hours (36.4%).

Table 1: Characteristics of high school students that completed online survey

Athlete demographics	Responses	
	n	%
Age		
Freshman	1	4.5
Sophomore	5	22.7
Junior	7	31.8
Senior	9	40.9
Gender		
Male	10	45.5
Female	12	54.5
Sport Type		
Team	10	45.5
Individual	12	54.5
Competition level		
Freshman/Sophomore	2	9.1
Junior Varsity	8	36.4
Varsity	12	54.5
Weekly training hours prior to lockdown		
Less than 15 hours	11	50.0
15-20 hours	8	36.4
20-25 hours	3	13.6

The impact that the COVID-19 shutdown had on athletic seasons is presented in Table 2. A vast majority (90.9%) of participants reported that important competitions or meets were cancelled due to COVID-19. Most (63.6%) reported receiving some form of virtual training from coaches, however 68.2% of participants reported that during the shutdown period they trained 8 hours or less. Twenty-five percent of female participants reported doing no training during the shutdown while all male participants reported that they continued to train. For additional physical activity beyond mandated training, 45.5% of participants reported doing moderate or strenuous levels of activity. Twenty-five percent of female participants reported doing no additional activity and most females (41.7%) reported doing light additional physical activity. All male athletes reported doing extra physical activity. With the majority doing light (40%) or moderate (50%) physical activity in addition to mandated training.

Table 2: Athletic impacts from COVID-19 pandemic on competition season during shutdown period

Impacts on season during shutdown period	Responses	
	n	%
Cancellation or postponement of important competitions or meets		
Yes	20	90.9
Maybe	1	4.5
No	1	4.5
Training status: whether received virtual training		
Yes	14	63.6
No	8	36.4
Weekly training hours during the COVID-19 shutdown		
Not training at all	3	13.6
Less than 5 hours	4	18.2
5-8 hours	8	36.4
8-12 hours	4	18.2
More than 12 hours	3	13.6
Other physical activities in addition to any mandated training		
Strenuous activities	2	9.1
Moderate activities	8	36.4
Light activities	9	40.9
Not at all	3	13.6

The psychological impacts during the shutdown period can be found in Table 3 (gender and sport type differences not presented in tables). Most of the athletes reported that they felt isolated or disconnected during the shutdown period of COVID-19 (81.8%: 31.8% answered yes and 50% answered sometimes). Of female participants 91.7% responded that they felt isolated at least some of the time while 70% of male respondents felt isolated at least some of the time. The rate of feeling isolated was similar between team sport and individual sport athletes with 80% of team sport athletes feeling isolated and 83.3% of individual sport athletes feeling isolated. For anxiety, depression, and frustration 86.4% of respondents reported experiencing these feelings (36.4% answered yes and 50% answered sometimes). Both genders had a high amount reporting that they experienced these mental states (90% of males and 83.3% of females). For individual sport athletes 100% reported feeling anxiety, depression, or frustration at least some of the time and 70% of team sport athletes felt this way. A majority (95.4%) of participants reported experiencing a lack of initiative with 68.2% of participants agreeing with the statement, "I did not look forward to anything", with answers ranging from sometimes to most of the time. Finally, 63.6% of participants felt that it was tough to deal with the situation.

Table 3: General psychological impacts from COVID-19 shutdown period

Items	Responses	
	n	%
Felt isolated/disconnected		
Yes	7	31.8
Sometimes	11	50.0
No	3	13.6
Maybe	1	4.5
Experienced anxiety/depression/frustration		
Yes	8	36.4
Sometimes	11	50.0
No	2	9.1
Maybe	1	4.5
Prefer not to say	0	0.0
Had a lack of initiative to complete tasks		
Yes	9	40.9
Sometimes	12	54.5
No	1	4.5
Maybe	0	0.0
Did not look forward to anything		
Did not apply to me	7	31.8
Applied to me sometimes	11	50.0
Applied to me frequently	2	9.1
Applied to me most of the time	2	9.1
Tough to deal with this situation		
Yes	14	63.6
No	5	22.7
Maybe	3	13.6

The sports-related impacts from the COVID-19 shutdown can be found in Table 4. During the shutdown period 72.7% of the athletes reported that they were worried about a loss of fitness, falling behind in physical preparedness, or of having a competitive disadvantage. For the impact that COVID-19 would have on the next season 50% reported that they were very concerned or extremely concerned (40.9% very concerned, 9.1% extremely concerned), and 59.1% believed that they would be able to catch up to their previous levels of fitness.

Table 4: Sports-related impacts from COVID-19 shutdown period on high school athletes

Questions	Responses	
	n	%
Worried about a loss of fitness, falling behind in physical preparedness, or of a competitive disadvantage during shutdown period		
Yes	16	72.7
No	5	22.7
Maybe	1	4.5
Concern over impact of shutdown on next season		
Not at all	2	9.1
Somewhat concerned	9	40.9
Very concerned	9	40.9
Extremely concerned	2	9.1
Belief in ability to catch up to previous fitness and technical levels		
Yes	13	59.1
No	2	9.1
Maybe	7	31.8

The current impact of COVID-19 can be found in Table 5. A small portion (18.2%) reported

that they fear getting COVID-19 and over half (54.5%) reported that they do not fear getting it. No male participants reported fearing getting COVID-19. Approximately 36% felt that they were able to return to their previous fitness and technical skill levels, with approximately the same amount feeling that they did not return to those previous levels, while 50% reported that they fear that sports will be shut down again.

Since returning to sport, getting exposed to or contracting COVID-19 are still a possibility, and if either situation happens, it results in quarantining or self-isolating. Since returning to sports 36.4% of participants reported that they have had to quarantine or self-isolate. Of these participants, 87.5% feared losing fitness or technical skills, 87.5% feared falling behind their teammates or competition, and 75% experienced anxiety, depression, or frustration at least some of the time while they had to quarantine (see Table 6).

Table 5: Current impact of COVID-19 on high school athletes

Items	Responses	
	n	%
Fear getting COVID-19		
Yes	4	18.2
No	12	54.5
Maybe	6	27.3
Fitness and technical skills returned to previous levels		
Yes	8	36.4
No	8	36.4
Maybe	6	27.2
Quarantined or self-isolated since return to sports		
Yes	8	36.4
No	14	63.6
Fear sports will be shut down again		
Yes	11	50.0
No	5	22.7
Maybe	6	27.3

Table 6: Impact of Quarantine or self-isolation since returning to sports

Items	Responses	
	n	%
Feared losing fitness or technical skills		
Yes	7	87.5
No	0	0.0
Maybe	1	12.5
Feared falling behind teammates or competition		
Yes	7	87.5
No	0	0.0
Maybe	1	12.5
Experienced anxiety, depression, or frustration		
Yes	4	50.0
Sometimes	2	25.0
No	0	0.0
Maybe	2	25.0

4. DISCUSSION

The purpose of this study was to determine how HS athletes were impacted by the shutdown period of COVID-19 and how it is currently impacting them. The results of the current study suggest that the COVID-19 pandemic shutdown and ongoing measures have had an impact on high school athletes' mental health and fitness. A majority of respondents (90.9%) had

cancellations or postponements of important competitions or meets due to the outbreak of COVID-19. During the time of the shutdown, the amount of time spent training decreased, with a majority of respondents (68.2%) training 8 hours or less a week. A similar study done with teenage athletes reported having 77.4% of their participants training less than 8 hours a week (Liu, 2020). Many different forms of training decreased in response to the COVID-19 shutdown including resistance training, endurance training, mobility training, and sport specific activities which had the greatest reduction (Jagim et al., 2020). In the current study, it was found that 13.6% did not do any training during the shutdown with females being more likely to do no training or a lower amount of hours training. In the USA, adolescent females were found to report a lower amount of physical activity than males (McGuine et al, 2021), which is similar to the current findings. University athletes had a decrease in the amount of physical activity they were doing as well (Meza, & Hall-López, 2021). The general population was also found to decrease the amount of physical activity they participated in during the shutdown period. In a German sample, the number of inactive individuals increased from 39.4% to 59.5% during the shutdown (Mutz, & Gerke, 2020). The amount of physical activity, exercise, or sports participation decreased overall (Mutz, & Gerke, 2020).

A decrease in training hours such as noted in the current study could have led to detraining. Reductions in training or a complete cessation leads to decreased VO₂max, decreased sprint speed and jumping ability (Koundourakis et al., 2014; Melchiorri et al., 2014). These changes can start occurring within a couple of weeks (Rodríguez-Fernández et al, 2018). During the shutdown period, in a group of adolescent soccer players there was a decrease in endurance, maximum speed, and oxygen consumption (Dauty et al, 2020). Among adult endurance athletes there were reported losses in muscular strength/endurance, cardiorespiratory fitness, mobility, and flexibility (Guilherme et al, 2020). The aforementioned losses of physical fitness were associated with social isolation (Guilherme et al, 2020).

A majority of participants in the current study reported feeling isolated (81.8%), and experiencing anxiety, depression, or frustration (86.4%) at least some of the time. Similarly, among another sample of teenage athletes, it was reported that a majority of participants felt this way with 90.5% of participants feeling isolated at least some of the time and 79.1% experiencing anxiety, depression, or frustration at least some of the time (Liu, 2020). In a study done with athletes from Spain it was found that young athletes had higher anxiety, depression, and social dysfunction symptoms than older athletes (Pons et al., 2020). Interestingly, in the current study individual sport athletes did not feel more isolated than team sport athletes, and individual sport athletes had a higher rate of feeling anxiety, depression, or frustration. Contrary to the findings in the current study, in a survey of US adolescent athletes it was reported that team sport athletes had a higher prevalence of moderate and severe anxiety and depression (McGuine et al, 2021).

Many athletes experienced a lack of initiative or motivation during the shutdown in this study. Among a sample of US athletes 67.6% reported a decrease in motivation in comparison to the pre-shutdown period (Jagim et al, 2020). The results of the aforementioned suggest a lesser rate of low motivation/initiative than in the current study, which had 95.4% experiencing a lack of initiative. Social isolation has been associated with low motivation, high stress, decreased sleep quality, and an increased consumption of alcohol in endurance adult athletes, particularly in runners (Guilherme et al., 2020). The current study found the rate of feeling isolated was higher in females than males (91.7%; 70%), and there was only a small difference between the genders for anxiety, depression, and frustration. Among US adolescent athletes, females had a higher prevalence of anxiety and depression (McGuine et al., 2021).

Despite the high number of participants that experienced anxiety, depression, frustration, lack of initiative, and that felt isolated, only a small amount of participants

(18.2%) feared getting COVID-19. In a sample of secondary school athletes, it was similarly reported that 17.4% of participants feared getting COVID-19 during the shutdown period (Liu, 2020). A majority of participants did report being worried about a loss of fitness, falling behind in physical preparedness, having a competitive disadvantage due to the shutdown period. Of the participants that have had to quarantine or self-isolate since returning to sports, a majority reported that they feared losing fitness or technical skills and feared falling behind teammates or competition. Most of these participants also reported experiencing anxiety, depression, or frustration during the time they had to quarantine. Fear of COVID-19 does not appear to be a major stressor among high school athletes; being removed from their regular sports participation does.

Limitations

Limitations of this study include having a small sample size which could be due in part to the short amount of time the survey was available. Another limitation of this study is that a majority of respondents were upperclassmen. This makes the data more representative of junior and senior high school athletes. Finally, a potential limitation is that some of the survey questions required participants to recall how they felt or about activities from several months ago.

Areas for Future Research

Future research should focus on how COVID-19 continues to impact HS athletes. Information gleaned from such research could help stake-holders further understand how different COVID-19 response guidelines impacted this age group and what type of help they may need in order to mitigate any negative consequences. Future research should also investigate the long-term effects of the COVID-19 pandemic on athletes. The impact of the COVID-19 response shutdown period and current guidelines could negatively affect athletes later in life.

5. CONCLUSION

The COVID-19 pandemic was a challenging time and continues to pose challenges to high school athletes. A majority of athletes faced cancellations or postponements at the beginning of that pandemic. Over half were receiving virtual training, but despite that, the amount of training decreased. This caused a loss in fitness and skills and was a stressor. The shutdown had an impact on the mental health of the athletes. They felt isolated, experienced anxiety, depression, and frustration. There was a fear of losing fitness and technical skills, and of falling behind teammates or competitors. Under the current guidelines, some of the athletes have had to quarantine since returning to sports. These periods of quarantining had the same effects on the athletes as those seen during the shutdown period: it impacted them mentally and physically. Under half of the respondents felt that they have returned to their previous fitness and technical skill levels since being back to training and competing. Over half of the participants feared that sports could be shut down again, while over half did not fear getting COVID-19.

The findings of this study suggest that high school athletes are more stressed about the impact COVID-19 has on their sports than on the possibility of getting sick. This age group of athletes could use additional mental health support to protect their health and wellbeing. Providing more virtual training that is adapted to at home environments should be provided to these athletes to help them maintain their fitness and skills, and to help protect their mental health.

6. APPLICATIONS IN SPORT

The COVID-19 pandemic has impacted many aspects of life, including sports. How high school athletes have been impacted and feel about this adversity in their lives is useful to

coaches, parents, schools, and others who are working with this age group to understand how these student athletes have responded to the hardship, including their mental health and overall wellbeing, and the support and help these athletes may need.

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