The COVID-19 Pandemic: A Cross-Sectional Analysis of Canadian University Students'

and Student-Athletes' Mental Health

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Abstract:

Student-athletes have shown to display poorer mental health than student non-athletes, typically due to the unique stressors of participating in collegiate sport. During the COVID-19 pandemic and with the implementation of public health response measures Şenışık et al. (2020) discovered that depression and anxiety symptoms were significantly lower in Turkish professional athletes than non-athletes, and similar among genders and sport types. Further research is required, and this study aims to identify differences among Canadian university student-athletes and non-athletes, males and females, and team and individual sport athletes on symptoms of depression, anxiety, stress, and distress during the 2019/2020 academic year. The Depression Anxiety Stress Scale – 21 and Impact of Events Scale – Revised were completed by 349 student-athletes (241 male and 108 female) and 142 non-athletes (77 male and 65 female). There were no main effects for gender or sport type, but student-athletes scored significantly higher than student non-athletes in depression ($p < .001$), anxiety ($p = .014$), stress ($p < 0.001$), and distress ($p = .001$). Interestingly, female team sport athletes reported greater levels of each measure than female individual sport athletes ($p = .011$). In conclusion, Canadian university student-athletes reported significantly higher levels of mental distress than student non-athletes during the 2019/2020 academic year, and there were no differences by gender or sport type. Although, female team sport athletes reported higher symptoms of depression, anxiety, stress, and distress than female individual sport athletes. This data was inconsistent with Şenışık et al. (2020), highlighting the need for more research to be done comparing post-secondary students and student-athletes to identify how the COVID-19 pandemic affected them, and how academic institutions can mitigate, and aid mental health disturbances caused by events of this nature.

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Table of Contents

List of Tables:

List of Figures:

List of Abbreviations:

DASS-21 – Depression Anxiety Stress Scale 21

IES-R – Impact of Events Scale-Revised

IPAQ – International Physical Activity Questionnaire

MANOVA – Multivariate Analysis of Variance

Chapter 1 - Introduction

1.1 Mental Health Among University Students and Student-Athletes

University students' participation in academics exposes them to a unique range of stressors. These stressors have the ability to manifest into mental health conditions such as depression and anxiety (Hamaideh, 2011). The World Health Organization (2018) defines mental health as a state of well-being in which an individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and is able to contribute to his or her community. Anxiety and depression are some of the most common mental health conditions experienced by university students. Anxiety encompasses the feelings of anticipation, specifically the anticipation of perceived threats in the future (Craske & Stein, 2016). Malhi and Mann (2018) stated that depression is a common illness that severely limits psychosocial functioning. Common symptoms of depression include negative mood, feelings of worthlessness, fatigue or loss of energy, change in weight or appetite and decreased ability to concentrate.

University students experience stressors on a day-to-day basis. These stressors, although similar in nature, can affect people differently. Stressors can include receiving a bad grade, missing the bus, and relationship conflicts. Due to the stressful nature of university, it is common for those attending post-secondary school to develop mental illness, the most prevalent being anxiety and depression (Ebert et al., 2019). Compared to the general population, students are almost 10% more likely to develop symptoms of depression (Ibrahim et al., 2014). Anxiety disorders are the second most common mental health issue found in the university student population, with female students being more likely to report this mental illness than their male counterparts (Eisenberg et al., 2007). The American College Health

Association (2019) released their results from the National College Health Assessment, which included 55, 284 surveys in 58 Canadian postsecondary institutions. Referring to the 12 months before this survey was conducted, 88.2% felt overwhelmed by all they had to do, 68.9% felt overwhelming anxiety, and 51.6% felt so depressed that it was difficult to function (American College Health Association, 2019).

Student-athletes are in a similar position to their student non-athlete peers. They experience the same educational demands but are also dealt unique stressors associated with their involvement in sport. Although there are numerous unique stressors that can harm a student-athletes mental health, there is also belief that sport can act as a protective measure against the development of mental illness (Egan, 2019). Egan (2019) also identified some stressors that are specific to student-athletes, such as the expectation to consistently perform at a high level and win, pressure originating from staff or the public, and risk of injury. Cox et al. (2017) examined a NCAA student-athlete population, finding that 8.7% of this sample indicated symptoms of depression, and student-athletes entering their first year of university athletics have been shown to display higher levels of depressive symptoms, compared to those in upper years. Wolanin et al. (2016) identified similar rates of depressive symptoms in a NCAA student-athlete population, and they also found that female student-athletes are more likely to develop depression and anxiety symptoms than male student-athletes. The NCAA Sport Science Institute (2016) stated that 31% of male and 48% of female student-athletes reported feeling overwhelming anxiety in the last 12 months.

Depression among student-athletes has been estimated to be around 10-21% of the population, and 31% of male and 48% of female student-athletes experience feelings of

depression or anxiety (Ryan, Gayles, & Bell, 2018). Rice et al. (2019) reviewed 61 studies for a systematic review and 27 for meta-analysis and found no difference in anxiety profiles between athletes and non-athletes. Participating in sport has also been shown to have positive effects on a variety of psychosocial related outcomes for youth athletes and adults such as sense of belonging, emotional support, and higher self-esteem (Andersen, Ottesen & Thing, 2019; Dalton et al., 2015). This mixed evidence is shown by Farrer et al. (2016) who found that the percentage of Australian student-athletes reporting symptoms of both major depression and generalized anxiety disorder was higher than university student non-athletes. Hence, the need to further examine the mental health differences of post-secondary student-athletes and students. Understanding the mental health status of students and student-athletes separately allows for more effective resources to be developed and implemented. Gender differences can be seen consistently in the literature, with female students reporting poorer mental health than male students. In a study conducted by Yang et al. (2007), female student-athletes were significantly more likely to experience symptoms of depression than male student-athletes. More recent data demonstrates these differences as well when examining the mental health of male and female university students. Female university students typically report elevated levels of psychological distress and poor mental health compared to male university students and the general population of the same age. Anxiety and depression symptoms are higher in female students than in their male counterparts (Porru et al., 2021). When looking at the general population, gender differences continue to exist from adolescence to older adults. Kiely, Brady, and Byles (2019) found that the mental health gap between males and females grows with age, with females consistently displaying worse mental health than males.

1.2 COVID-19 Pandemic in Canada

The first confirmed case of COVID-19 in Canada was reported on January 25th, 2020. This made the country one of the first to report a confirmed case of the virus, which eventually reached roughly 32,000 by April 18, 2020 (Government of Canada, 2020). The pandemic and related measures have prevented people from being able to work, leading Canada to create initiatives called the Canadian Emergency Response Benefit and Canada Emergency Wage Subsidy. Canada followed the World Health Organization's recommendations to prevent the spread of COVID-19 (Lee, Akuffo, & Shaw, 2020). Detsky and Bogoch (2020) stated that provinces across Canada have been affected very differently; Ontario and Quebec reported the highest number of cases, whereas the territories, prairies, and eastern provinces have reported fewer cases. To prevent further spread of the virus, Canada implemented social (physical) distancing measures, which forced schools to shift to virtual learning and non-essential businesses to close. To enforce these new restrictions, if people from different households were caught socializing the police could issue a fine for non-adherence to the rules (Detsky & Bogoch, 2020).

1.3 Students' and Student-Athletes' Mental Health During the COVID-19 Pandemic

Some students find their campus to be a second home and due to the time away from campus they have experienced emotions such as frustration, anxiety, and betrayal (Zhai & Du, 2020). Students may have also struggled with loneliness, and isolation due to the disconnection from friends and family. Son et al. (2020) set out to determine how university students were affected by the COVID-19 pandemic with respect to depressive symptoms and help seeking behaviour. Of the 195 responses, 44% experienced depressive symptoms during the pandemic and 23% utilized negative coping methods to manage their stress and anxiety which included

drinking alcohol, smoking, sleeping in longer and ignoring COVID-19 news updates. Dartmouth University students displayed consistently heightened levels of depression and anxiety during the 2020 Winter term; this increase occurred after the announcement of students needing to leave campus and begin virtual schooling (Huckins et al., 2020).

The student-athlete population had their playing seasons abruptly ended, which included the loss of in-person interaction with teammates. Graupensperger et al. (2020) found that teammate interactions (virtual or in-person) were negatively associated with feelings of depression, and that student-athletes who received support from athletic staff felt more connected with their teammates reported higher levels of well-being. The COVID-19 pandemic caused athletes to be confined to their homes, this abrupt change in training, and access to their teammates has been shown to lower athletes' mental health (Davis et al., 2020). By following a training program that is specifically tailored to an athlete confined to their house, strength coaches may have been able to prevent negative effects to the athlete's physical and mental health (Tayech et al., 2020). Athletes' training sessions have been individual and shorter in duration; this change from their previous training structure is associated with decreased motivation and increased depression, anxiety, and stress (Facer-Childs et al., 2021). It appears females continue to display higher levels of psychological distress and poorer mental health than male students during the COVID-19 pandemic (Prowse et al., 2021). Although males' and females' mental health has worsened during the COVID-19 pandemic, females have reportedf more symptoms of anxiety, depression, and lower self-esteem than males (Gestdottir et al., 2021).

Chapter 2 - Statement of Problem

Due to the recency of the COVID-19 pandemic, there is limited research on how Canadian university students and student-athletes have been affected and what impact it has had on their mental health. This creates a gap where this study can begin to clarify what the mental health status of students and student-athletes was during the COVID-19 pandemic.

Şenışık, Denerel, Koyagasioglu and Tunc (2020) investigated how the mental health of professional athletes and non-athletes in Turkey had been affected by the isolation caused by the COVID-19 pandemic. Six hundred and twelve participants (418 athletes, 194 non-athletes) completed the Depression-Anxiety-Stress Scale 21 (DASS-21), the Impact of Events Scale-Revised (IES-R), and International Physical Activity Questionnaires (IPAQ). The DASS-21, IES-R, and IPAQ questionnaires were used to identify the mental health status of the participants, distress caused by the event of interest, and physical activity levels of the participants, respectively. The researchers determined that depression and anxiety symptoms were significantly lower in athletes compared to non-athletes. It was the researchers' belief that the athletes' participation in sport had a positive effect on their mental health status prior to the pandemic and participating in physical activity may help to prevent mental health deterioration.

There are many limitations pertaining to the current literature. These limitations range from small sample sizes causing results to be deemed non-significant because of lack of power, and samples including only undergraduate students, affecting generalizability (Huckins et al., 2020). Graupensperger et al. (2020) stated that due to the nature of pandemics, this information may not be valuable until a similar situation arises. Auerbach et al. (2016) states that most of the research regarding college and university student mental health has mainly taken place in the USA.

The current study was designed to clarify what Canadian university students' and student-athletes' mental health status was during the COVID-19 pandemic by replicating the methods used by Şenışık et al. (2020). Although there is a general understanding of the effects the pandemic had on student and student-athlete mental health, it is important to identify the current mental health status of Canadian university students and student-athletes. To increase the generalizability of this study, students and student-athletes in any year of study of their undergraduate or graduate degree will be invited to participate. Regarding Graupensperger et al.'s (2020) statement that this information may not be valuable unless similar events arise, it is important to understand how students and student-athletes experience events similar to the COVID-19 pandemic to provide adequate services if a similar event were to happen in the future. According to Esterwood and Saeed (2020), the COVID-19 pandemic can be compared to natural disasters. The pandemic has been shown to cause similar disruptions to mental health as natural disasters, such as earthquakes and tsunamis. Aside from natural disasters, it is believed that war conflicts, and social crises causes similar detriments to individuals' mental health (Ćosic et al., 2020). It is also important to continue to research the COVID-19 pandemic in this context to inform recovery and intervene if needed.

Chapter 3 - Aims and Objectives

        The aim of this study was to quantify Canadian university students' and student-athletes' mental health, and the level of distress during the COVID-19 pandemic. Secondary objectives included the examination of whether sport type and gender of students and student-athletes were related to the development of symptoms of depression, anxiety stress and distress from significant events.

*Research Question 1***:** Are students and student-athletes exhibiting the same levels of depression, anxiety, stress, and distress?

*Hypothesis 1***:** Student-athletes will report increased levels of depression, anxiety, stress, and distress relative to non-athletes.

Research Question 2: Are self-identifying males and self-identifying females exhibiting the same levels of depression, anxiety, stress, and distress?

Hypothesis 2: Females will report increased levels of depression, anxiety, stress, and distress relative to females.

Research Question 3: Are team sport and individual sport athletes exhibiting the same levels of depression, anxiety, stress, and distress?

Hypothesis 3: Team sport athletes will report increased levels of depression, anxiety, stress, and distress relative to individual sport athletes.

Chapter 4 - Design and Methods

4.1 Inclusion and Exclusion Criteria

Participants were eligible to participate in this study if they were enrolled in a Canadian university during the 2020/2021 academic year. To be identified as a student-athlete the participant must have competed for a U Sport, Ontario University Athletics, Atlantic University Sport, Réseau du Sport Étudiant du Québec, or Canada West affiliated team.

Participants enrolled in an online academic program prior to the pandemic were excluded from the dataset. The reason for this exclusion is because they will not experience the disruptions to in-person classes and removal from campus as the students who took classes in-person had. Participants who identified themselves as non-varsity student-athletes competing at a provincial, national, or international level will be excluded from the dataset. Competing with an athletic program at these levels may have similar demands of varsity student-athletes, and act as a confounding variable. If the participant met any exclusion criteria during their participation, their response was removed from the dataset.

4.2 Participant Recruitment

To gain a holistic view of the Canadian university student and student-athlete population, athletic directors, and professors at universities across Canada were contacted and asked to distribute the recruitment email to their students and/or student-athletes. Student-athletes were recruited through the redistribution of the recruitment script by their respective athletic directors. Student non-athletes were recruited through faculty members redistributing the recruitment email, at the same universities used to recruit student-athletes. Faculty members are not identified, only the universities involved in data collection are named. The

rationale for choosing the proposed institutions was the belief among the research team that

they are more likely to redistribute the recruitment email due to previously made connections.

Recruitment began in May 2021, following the completion of the 2020/2021 academic

year and was completed in July 2021.

The participants gave their consent prior to accessing the questionnaires. This was

clearly outlined in the recruitment email before initial data was collected (see Appendix B for

the consent form).

G*Power was utilized to determine an adequate sample size. Due to the replication of

Şenışık et al. (2020), their results and data analysis were examined, and it was estimated that

the researchers found a small to moderate effect size. With this knowledge, the G*Power

inputs were d = 0.35 (small to moderate), alpha = 0.05, power = 0.8. The G*Power analysis was

conducted for a single-tailed analysis of the difference between two independent means

because the difference (higher or lower) between two equal groups. With this information,

G*Power suggested a sample size of 102 students and 102 student-athletes, for a total of 204

participants (Faul et al., 2007).

4.3 Participants

There were 1573 responses from Canadian university students. Of the original

responses, 1080 were removed due to being incomplete or meeting the exclusion criteria.

Specifically, 52 responses were removed due to the identification as non-binary/third gender or

prefer not to say, 14 responses were removed because the participant identified as a provincial,

national, or international athlete, and 764 responses were removed because the participant

was enrolled in an online program. The remaining 250 responses were removed because they

were incomplete. Due to the low response rate of non-binary/third gender individuals, we were

not able to include this demographic in the analysis. Stated earlier, students enrolled in online

programs did not experience disruptions to in-person classes and this would have acted as a

confounding variable producing inaccurate results. The final sample consisted of 320 male and

173 female participants, including 349 student-athletes and 144 student non-athletes. Mean

age of participants was 20.67 (SD = 1.77). Table 1 further outlines descriptive statistics of the

participants. Table 2 are descriptive statistics specific to the student-athlete portion of the

sample.

Table 1.
Descriptive statistics of participants: Canadian university attended, self-identification of race/ancestry, disability, living situation, financial situation, and experiences with COVID-19.

	Frequency (n)	Percent (%)
Canadian University		
Brock University	133	26.8
Dalhousie University	56	11.3
McGill University	74	14.9
McMaster University	7	1.4
Memorial University of Newfoundland	50	10.1
Queens University	1	0.2
Ryerson University	1	0.2
Trent University	1	0.2
York University	4	0.8
University of Fraser Valley	22	4.4
University of Guelph	1	0.2
University of Lethbridge	25	5.0
University of Ottawa	2	0.4
University of Toronto	3	0.6
University of Western Ontario	1	0.2
University of Windsor	71	14.3
University of Winnipeg	22	4.4
Wilfrid Laurier University	23	4.6
Self-Identification of Race/Ancestry		
Arab	14	2.8
Black	39	7.8
Chinese	7	1.4
Filipino	4	0.8
Indigenous (Outside of Canada)	83	16.7

	Frequency (n)	Percent (%)
Indigenous Peoples of Canada	184	37.0
Japanese	6	1.2
Korean	3	0.6
Latin, Central, or South American	9	1.8
South Asian	7	1.4
Southeast Asian	5	1.0
West Asian	1	0.2
White	135	27.2
Disability		
Blind/Visually Impaired	36	7.2
Deaf/Hard of Hearing	26	5.2
Mental Health Condition	94	18.9
Neurological	20	4.0
Physical Disability	16	3.2
Another Condition Not Listed	24	4.8
I Prefer Not to Say	5	1.0
Not Applicable	276	55.5
Living Situation		
Off Campus	198	39.8
On Campus	299	60.2
Financial Situation		
Always or Often Stressful	171	34.4
Sometimes Stressful	181	36.4
Rarely or Never Stressful	145	29.2
Experiences with COVID-19		
Tested Positive	375	75.5
Tested Negative	30	6.0
Not Applicable	92	18.5

Table 2
Descriptive statistics of the student-athlete population: sport type, training frequency and method, and teammate interaction frequency and method.

	Frequency (n)	Percent (%)
Sport Type		
Team	216	60.5
Individual	141	39.5
Training Frequency		
Always or Often	78	21.8
Sometimes	157	44.0
Rarely or Never	122	34.2
Training Method		
Exclusively or Mostly In-Person	240	67.2
About the Same In-Person and Virtual	78	21.8

Mostly or Exclusively Virtual	39	10.9
Teammate Interaction Frequency		
Always or Often	72	20.2
Sometimes	163	45.7
Rarely or Never	122	34.2
Teammate Interaction Method		
Exclusively or Mostly In-Person	168	47.1
About the Same In-Person and Virtual	84	23.5
Mostly or Exclusively Virtual	105	29.4

4.4 Data Collection and Analysis

Due to the pandemic and restriction of in-person contact, the questionnaires were completed via Qualtrics. Qualtrics gives researchers the ability to replicate questionnaires, allowing a niche method to collect data that prevents the interactions between participants and researcher. An added benefit with the use of Qualtrics is the anonymity for the participants. By keeping their identity anonymous they are more likely to participate and provide truthful answers (Boas, Christeson & Glick, 2018).

Data analysis began with randomly selecting matched groups of equal sizes for each research question (see Results). Upon completion of this, each hypothesis was tested with a Multivariate Analysis of Variance (MANOVA).

4.5 Demographic Questionnaire

Before participants could complete the questionnaires, they were prompted with a demographic questionnaire. The variables included were Canadian university attended during the 2020/2021 academic year, year of study, age, gender, self-identification of race/ancestry, disabilities or medical conditions, financial status, living situation, COVID-19 experiences, varsity athlete status, method and frequency of training and method and frequency of interaction with teammates. Refer to Appendix C for a copy of the demographic questionnaire.

4.6 - Impact of Event Scale-Revised (IES-R)

This questionnaire can quantify the distress experienced by an individual following a major life event. This questionnaire contains 22 items, with three subscales that evaluate avoidance, hyperarousal, and intrusion. The scale uses a 5-point Likert scale with anchors of 0 (not at all), and 4 (extremely) (Şenışık et al., 2020). A cutoff point of 24.5 is used to identify partial symptoms of post-traumatic distress (Asukai et al., 2002). Asukai et al. (2002) found 24.5 to be a reliable cutoff for the Japanese version of the Impact of Events Scale – Revised, which has proven reliable and valid when compared to the IES-R. A score of 33 and above will be classified as a probable diagnosis for post-traumatic distress due to its high sensitivity (0.91), specificity (0.82), positive predictive value (0.90) and negative predictive value (.84) (Creamer, Bell & Failla, 2003).

Morina, Ehring and Priebe (2013) stated that the IES-R is one of the most widely used scales to assess levels of distress following a major life event and demonstrated good psychometric properties. Creamer, Bell and Failla (2003) conclude that the scale has high internal consistency (alpha = 0.96) and its correlation to the Post Traumatic Stress Disorder Checklist was high (0.84). Utilizing SPSS, Cronbach's alpha was found to be 0.945 which can be identified as high internal consistency for the IES-R.

4.7 - Depression-Anxiety-Stress Scale (DASS-21)

This is a shortened version of the 42-item depression-anxiety-stress scale created by Lovibond and Lovibond (1996). It includes 21 items and is used to assess mental health. It includes depression, anxiety, and stress subscales consisting of seven items each. There are four short answer options used to assess the severity of each subscale. The items consist of a Likert

type scale from 0 'does not apply to me' to 3 'applies to me very much or most of the time' (Şenışık et al., 2020).

Depression, anxiety, and stress scoring utilized cutoffs of 10, 9.5 and 9.5 respectively. Per Lovibond and Lovibond (1996), depression scores greater than 10 identify severe symptoms, anxiety scores greater than 9.5 identify extremely severe symptoms, and stress scores greater than 9.5 identify moderate symptoms.

This questionnaire cannot be used to diagnose disorders, but instead provides clarity as to what the participants' mental health symptoms are, with respect to a specific event. Osman (2012) states that the DASS-21 questionnaire has been used widely in research and displays strong internal consistency of the total and scale scores. Utilizing SPSS, Cronbach's alpha was found to be 0.950 which can be identified as high internal consistency for the DASS-21.

Refer to Appendix D and E for outlines of the IES-R and DASS-21 questionnaires, respectively.

4.8 - Debriefing Form
The final part of the data collection process is the debriefing form. This form provided the participants with the rationale as to why this study was conducted, a reminder that their data will remain confidential, and mental health resources if they were to want to seek help from a professional. Refer to Appendix F for a copy of the debriefing form.

Chapter 5 - Results

5.1.1 Varsity Status and Gender

A Multivariate Analysis of Variance (MANOVA) was used to answer the primary research question regarding interactions between varsity status and gender, and their effect on the dependent variables of depression, anxiety, stress, and distress.

5.1.2 Assumptions

As the smallest cell in the design was female student non-athletes, with a n of 64, cell sizes of 64 were randomly chosen from the larger sample for female athletes and both male groups. This resulted in a balanced design with equal responses in all cells, which has been shown to be robust with respect to violations of assumptions (Tabachnick, Fidell & Ullman, 2019). Each response in this sample was independent, including 128 students and 128 student-athletes, each made up of 64 males and 64 females for a total of 256 participants. Table 3 gives the descriptive statistics for the dependent variables with these groups. The assumption of normal distribution was assessed through the Shaprio-Wilk test. Two variables, females' (p=0.096), and student-athletes' (p=0.421) distress scores, did not satisfy normal distribution, but all others displayed normal distribution (p>0.05). Levene's Statistic was used to test the assumption of homogeneity of variances; all tests were non-significant (p>0.05), indicating the presence of homogeneity of variances. Box's M Statistic was used to determine homogeneity of covariance matrices; this test was non-significant (p=0.455), which suggests that the data upholds the assumption. Pillai's trace was the test statistic of interest due to its robustness for general use (Olson, 1979). A scatterplot matrix was utilized to determine linearity, all permutations displayed positive linear relationships.

Table 3

Group mean scores and standard deviations associated with each dependent variable (depression, anxiety, stress, and distress), and fixed variables (student-athletes, students, males, and females).

| | DASS-21 | | | | | | IES-R | |
| | Depression | | Anxiety | | Stress | | Distress | |
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Female Students	7.08	4.88	7.72	4.66	6.67	4.73	31.09	15.57
Male Students	7.11	5.04	7.69	4.72	7.42	5.09	31.53	16.54
Female Student-Athletes	9.03	3.54	8.97	4.35	8.52	4.56	37.33	15.85
Male Student-Athletes	8.60	4.23	9.05	4.51	8.94	4.63	37.45	15.69

Note. Each variable on the DASS-21 (depression, anxiety, and stress) have ranges from 0-21. Depression scores greater than 10 indicate symptoms. Anxiety scores greater than 9.5 indicate extremely severe symptoms. Stress scores greater than 9.5 indicate moderate. The IES-R has a range from 0-88; scores greater than 24.5 indicate partial symptoms of distress, and scores greater than 33 indicate a probable diagnosis.

5.1.3 Hypothesis testing

A MANOVA revealed no significant interaction between gender and varsity athlete status, and no significant main effect for gender. However, there was a significant effect for varsity athlete status ($F_{(4, 249)} = 2.914$, $p = .022$, $n_p^2 = .045$). This multivariate effect was followed up with univariate tests for each of the dependent variables. Varsity athletes experienced significantly higher levels of depression ($F_{(1, 252)} = 8.621$, $p = .004$, $n_p^2 = .033$), anxiety ($F_{(1, 252)} = 5.230$, $p = .023$, $n_p^2 = .020$), stress ($F_{(1, 252)} = 7.978$, $p = .005$, $n_p^2 = .031$), and distress ($F_{(1, 252)} = 9.336$, $p = .002$, $n_p^2 = .036$) than their non-athlete peers during the 2019/2020 academic year.

5.2 Gender and Sport Type

A second MANOVA was used to answer the secondary research question regarding interactions between gender, and sport type and their effect on the dependent variables of depression, anxiety, stress, and distress.

5.2.1 Assumptions

As the smallest cell in the design was female team sport athletes, with an n of 52, cell sizes of 52 were randomly chosen from the larger sample for female individual sport athletes and both male groups to increase the robustness of the design, as noted above. This resulted in a balanced design in which each response is independent, including 104 team sport and 104 individual sport athletes, each made up of 52 males and 52 females for a total of 208 participants. Table 4 gives the descriptive statistics for the dependent variables with these groups. Normal distribution was assessed through the identification of the Shaprio-Wilk test. The normality assumption was not upheld ($p > 0.05$) for depression (male, female, team, and individual), anxiety (female), and stress (male, female, and individual). Levene's Statistic was used to identify homogeneity of variances; all tests were significant ($p < 0.05$), indicating the absence of homogeneity of variances. Box's M Statistic was used to determine homogeneity of covariance matrices; this test was significant ($p = 0.016$), which assumes the presence of heteroscedasticity. A scatterplot matrix was utilized to determine linearity, all permutations displayed positive linear relationships. The analysis was carried out due to the MANOVA being considered robust to violations of these assumptions because the cell sizes are large (i.e., > 30) and equal (Tabachnick, Fidell & Ullman, 2019). According to Verma and Abdel-Salam (2019), one weakness of the Shapiro-Wilk test statistic is giving significant results for a large sample due to slight deviations from normality. Due to this, along with a large sample size, data

analysis was continued, and it is believed these results are representative of the larger

population.

Table 4

Group mean scores and standard deviations associated with each dependent variable (depression, anxiety, stress, and distress), and fixed variables (student-athletes, students, males, and females).

	DASS-21						IES-R	
	Depression		Anxiety		Stress		Distress	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Female Team Sport	10.21	3.49	10.20	3.17	9.71	3.80	39.79	13.07
Female Individual Sport	7.46	4.82	7.50	4.57	7.23	4.53	32.44	15.22
Male Team Sport	8.71	4.72	9.21	4.88	8.48	4.84	37.40	18.86
Male Individual Sport	9.85	4.34	10.06	4.06	10.25	3.78	40.94	12.80

Note. Each variable on the DASS-21 (depression, anxiety, and stress) have ranges from 0-21.

Depression scores greater than 10 indicate severe symptoms. Anxiety scores greater than 9.5

indicate extremely severe symptoms. Stress scores greater than 9.5 indicate moderate

symptoms. The IES-R has a range from 0-88; scores greater than 24.5 indicate partial symptoms

of distress, and scores greater than 33 indicate a probable diagnosis.

Figure 1

Group Mean Depression Score by Gender and Sport Type
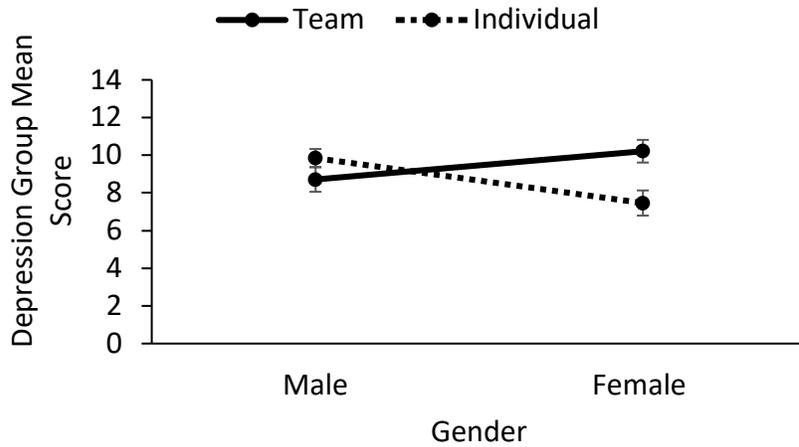
Note. Female team sport athletes scored significantly higher than female individual sport athletes, displaying higher amounts of depression symptoms.

Figure 2

Group Mean Anxiety Score by Gender and Sport Type

Note. Female team sport athletes scored significantly higher than female individual sport athletes, displaying higher amounts of anxiety symptoms.
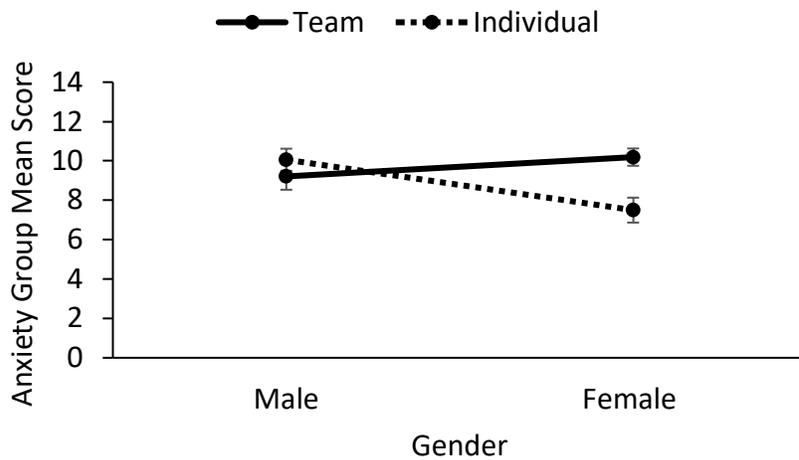
Figure 3

Group Mean Stress Score by Gender and Sport Type

Note. Female team sport athletes scored significantly higher than female individual sport athletes,

displaying higher amounts of stress symptoms.

Figure 4

Group Mean IES-R (Distress) Score by Gender and Sport Type

Note. Female team sport athletes scored significantly higher than female individual sport athletes,

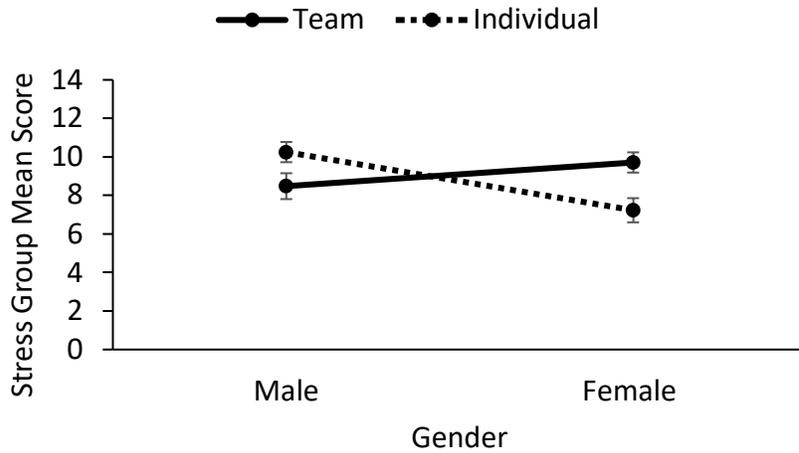*displaying higher amounts of anxiety symptoms.*

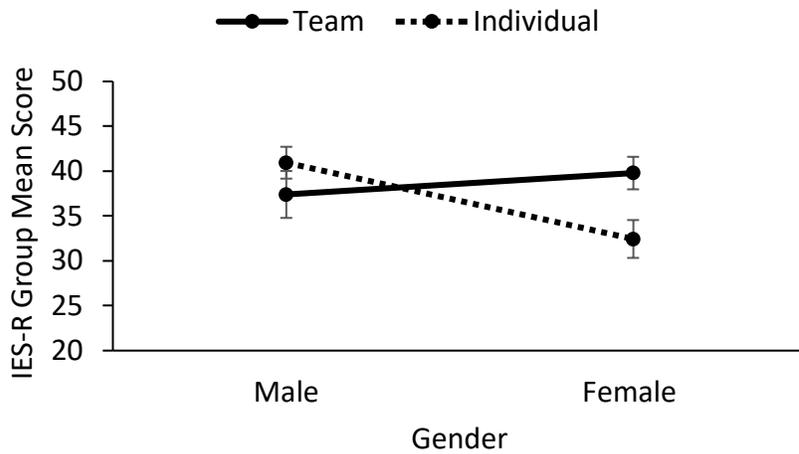### 5.2.2 Hypothesis Testing

A significant multivariate interaction was found for gender*sport type ($F_{(4, 201)}$ =

3.366, p = .011, n_p^2 = .063). There were no significant main effects of gender and sport type.

This multivariate effect was followed up with univariate tests for each of the dependent variables revealing significant interactions between gender*sport type and depression (F (1, 204) = 10.253, p = .002, n_p^2 = .048), anxiety (F (1, 204) = 9.156, p = .003, n_p^2 = .043), stress (F (1, 204) = 12.930, p = <.001, n_p^2 = .060), and distress (F (1, 204) = 6.683, p = .10, n_p^2 = .032). Analysis of simple effects revealed that female team sport athletes displayed significantly higher levels of depression (t (102) = 3.333, p = 0.001), anxiety (t (102) = 3.493, p = <.001), stress (t (102) = 3.030, p = .003), and distress (t (102) = 2.641, p = .010) than female individual sport athletes; there were no significant differences between male team or individual sport athletes.

Chapter 6 - Discussion

The goal of this study was to identify the mental health status of Canadian university students and student-athletes during the 2019-2020 academic year, amidst the first wave of the COVID-19 pandemic. The primary research question aimed to identify significant differences of mental health between students and student-athletes. Subsequent research questions were used to identify differences between males and females, and team and individual sport athletes. The hypotheses were that student-athletes, females, and team sport athletes would display significantly higher levels of symptoms of depression, anxiety, stress, and distress relative to student nonathletes, females, and individual sport athletes, respectively. Varsity athletes reported significantly higher levels of depression, anxiety, stress, and distress than their non-athlete peers during the 2019/2020 academic year. There were no significant differences between males and females, or team and individual sport athletes, but there was an interaction whereby female team sport athletes showed higher depression, anxiety, stress, and distress than female individual sport athletes.

6.1 Post-Secondary Students' and Student-Athletes' Mental Health

The current research project is consistent with prior literature relating to student populations' mental health; it was found that during the pandemic Canadian university student-athletes experienced higher levels of depression, anxiety, stress, and distress than their non-athlete counterparts. The literature to date is not conclusive on the prevalence of mental health issues of student-athletes compared to students. However, there is evidence that student-athletes may experience higher depression and anxiety than their non-athlete counterparts (Edwards & Froehle, 2021; Neal et al., 2013).

This project adds to this literature specifically within the context of the COVID-19 pandemic and supports the notion that student-athletes' mental health continues to be a significant concern. Student-athletes may have been more affected by COVID than their peers. Although students experienced the feelings of being kept away from campus and feelings of loneliness due to isolation (Zhai & Du, 2020), student-athletes were not able to compete in their sport, engage with their teammates less, and had limited access to staff (coaching staff, strength and conditioning coaches, athletic therapists, etc.) compared to a normal year (Haslam et al., 2021). Specific to the student-athletes in this study, although 67.3% trained exclusively in-person, the majority of the student-athletes (78.2%) reported training sometimes, rarely, or never. Teammate interactions were mainly in-person (47.1%) but 79.9% of the student-athletes interacted sometimes, rarely, or never with their teammates. It cannot be determined if this occurred due to the COVID-19 pandemic. These limitations could have affected their athletic identity, in turn increasing feelings of depression and anxiety (Sanders & Stevenson, 2017).

Interestingly, these results contradicted those of Şenışık et al. (2020), who found during isolation due to the COVID pandemic, non-athletes reported higher levels of depression and anxiety than athletes. This may be due to the particular difficulties university students experienced during the pandemic. Over the course of 6 months during the COVID pandemic psychological well-being among post-secondary students in the UK decreased, and perceived stress increased (Savage et al., 2020). Two thirds of university students in Australia revealed low or very low wellbeing, caused by negative overall learning experience and fear of COVID (Dodd et al., 2021). Student-athletes' mental health have been adversely affected by concerns pertaining to COVID. Social support can influence mental health positively and reduce negative

impacts of COVID on the student populations mental health (Abdolahnezhad, Andam, & Rajabi, 2021), due to the pandemic related measures student-athletes had decreased access to their main support networks (teammates, coaching staff, athletic therapists, and strength coaches) which could have negatively affected their mental health. Data was collected during the third wave of the COVID-19 pandemic; May 2021 to July 2021. During this time, Ontario began providing vaccinations to the public, non-essential businesses opened at 15% capacity, and outdoor team/individual sports were permitted to train with up to 10 people (Government of Ontario, 2021). Athlete mental well-being may have decreased because of abrupt changes to their routine including less physical activity, limited resources, and delays/cancellations of sporting events (Shah, Jain, & Glick, 2021). There is also a potential that confounding variables led to this significant difference. Since diagnosed mental health disorders and other variables relating to poor mental health (financial and living instability, etc.) were not controlled there is potential that these data were wrongly deemed significant.

Referring to Table 3, the average distress scores for athletes in this study was 37.39. When comparing this to the general cutoff scores associated with the IES-R, the participating athletes scores can be classified as a probable diagnosis for post-traumatic distress relating to the pandemic. Both students and student-athletes require mental health resources to mitigate and aid mental health issues during this time. Institutions should promote help-seeking behaviors for student-athletes and develop specialized resources for this population.

6.2 Mental Health of Males and Females

Female students have consistently been shown to experience higher levels of psychological distress and poor self-perceived mental health compared to male students in Canada and USA (Becerra & Becerra, 2020; Sullivan, Blacker, & Murphy, 2019). These

differences have been seen during the pandemic as well; females scored significantly higher than males on symptoms of depression, stress, and anxiety (Ahuja, Syal, & Kaur, 2020; Chima et al., 2022; Duncan, 2020). Both genders have estimated that their mental health has worsened during the pandemic (Gestsdottir et al., 2021), but female students have shown to report higher levels of stress and worse mental health than male students (Barros & Sacau-Fontenla, 2021). Due to the disruptions to the athletes' competitive seasons, team sport athletes had interacted with their teammates less and were not able to participate in their respective sports.

It was expected that there would have been a difference in mental health status between genders, with females reporting higher symptoms of depression, anxiety, stress, and distress, but this difference was not observed in this study. Females develop stronger social networks and sources than males. During the pandemic social networks and sources of support were diminished due to lockdown measures, which could affect females more than males. Therefore, females were expected to report higher levels of depression, anxiety, stress, and distress because a lack of support networks is shown to cause deteriorations to mental health (Elmer, Mepham, & Stadtfeld, 2020). It is possible there was no gender difference because male students' depression, anxiety, stress, and distress symptoms had elevated during the time of data collection to the degree that gender differences were non-significant. Both males and females reported significantly higher levels of mental distress during the pandemic than before the pandemic (Knapstad et al., 2019; Twenge & Joiner, 2020). Another potential reason for the lack of significant differences between males' and females' mental health could be the population from which the data were collected. Prior to the pandemic, Canadian university students did not consistently exhibit gender differences related to mental health; Van

Slingerland, Durand-Bush, and Rathwell (2018) did not identify a mental health functioning

difference between male and female student-athletes.

6.3 Sport Types Effect on Mental Health

Athletes participating in individual sports typically experience increased levels of

psychological distress when compared to team sport athletes. This difference of mental health

issues has been displayed before and after the onset of the COVID-19 pandemic. Before the

pandemic, 13% of individual sport athletes displayed symptoms of anxiety or depression

compared to 7% of team sport athletes (Pluhar et al., 2019). During the pandemic individual

sport athletes continued to display a difference of mental wellbeing (Uroh & Adewunmi, 2021).

The hypothesis believing team sport athletes would report higher levels of depression, anxiety,

stress, and distress originated from team sport athletes enjoying their sport more than

individual sport athletes (Jakobsen, 2014), and team sport athletes developing stronger social

networks with their teammates than individual sport athletes (Vella et al., 2017).

No mental health differences were observed between team and individual sports, other

than female team sport athletes scoring higher than female individual sport athletes on

depression, anxiety, stress, and distress. A potential explanation for the differences found

between female team and individual sports could arise from reliance on social networks. As

previously stated, females rely on their social networks for support and disruptions to this

social network can worsen mental health. Since team sport athletes develop stronger

relationships with their teammates, it is possible that the disruptions to social networks during

the pandemic affected female team sport athletes more than males or female individual sport

athletes. Again, it is believed that this difference was not observed between female team and

female individual sport athletes because Canadian university athletes have not been researched

enough to completely understand how the pandemic has affected the mental health of this population. According to a systemic review conducted by Jia et al. (2022), female elite athletes were more likely to report poorer mental health than male elite athletes, but there were mixed results between types of sport. Both individual and team sports were associated with different increased risks of poor mental health. These mixed results highlight the need for continued research to understand if and why these mental health differences can occur between genders and types of sport during the COVID-19 pandemic.

6.4 Strengths and Limitations

The main strengths of this project are the utilization of complete responses, and matched groups. The purpose of this study was to identify the mental health status of Canadian university students and student-athletes during the 2019/2020 academic year. Initially, there were over 1000 responses to this study, with this large volume we were able to eliminate any that did not have complete data. This strengthened the results and allowed the making of more accurate examinations. By using matched groups, we were able to obtain results that were robust to deviations from assumptions.

The main limitations associated with this project include the cross-sectional study design, no control of confounders, high potential for recall bias, and online nature of data collection. This study can give researchers a look at the mental health status of Canadian university students and student-athletes at a specific point in time. This data does not allow us to identify causes of possible mental health concerns or how mental health of this population has changed over time. Although the researchers conducted data analysis with matched groups based on the hypothesis of interest, the analyses did not control for confounding variables. Confounding variables such as diagnosed mental health disorders, financial instability, unstable

living situations, and race/ancestry could have skewed the results revealing significant data.

Data for this study was collected during Spring and Summer of 2021, although the participants were completing questionnaires relating to the disruptions during their 2019/2020 academic year. The length of time between the collection and event of interest was significant, therefore increasing the potential for answering inaccurately. Conducting a research project purely online although efficient, comes with its issues. Commonly, participants may lose their concentration and complain that the survey is too long (Lefever, Dal & Matthiasdottir, 2007). Using an online method of data collection outlined by Andrade (2020) include: only those who are literate and have access to internet will be able to participate. Individuals are more likely to participate if they feel connected to the study (distressed by pandemic, ongoing mental health condition). This type of bias, self-selection bias, occurs when participants disproportionately select themselves into a group. In this case, the group would refer to being included in the study and gives the researchers disproportionate view of the population of interest (Elston, 2021). The sample consisted largely of Brock University students (26.8%) which caused a lack of diversity from campuses across Canada, this data may be more representative of the Brock University population rather than nationwide.

6.5 Future Directions

We believe there are two main directions this study can lead to: identifying measures that Canadian universities can implement to aid their students' mental health concerns post-pandemic and creating strategies that can aid students return to in-person learning for the 2022/2023 academic year. The COVID-19 pandemic related measures lasted over 2 years and there is growing concern for post-secondary students' mental health. University students spend a significant amount of time at their institution, thus there should be some structure in place

29

that can be used to prevent, and care for any mental health concerns that may arise. These

students have possibly been away from their campus for most of the pandemic and moving

back to in-person learning will be a major change. Professors and university staff need to be

equipped with training pertaining to identifying mental health disturbances and engaging

students in the classroom to ensure that the students transition back to in-person learning will

be positive.

Future research should look to discover how student-athletes and students coped with

mental health disturbances during the COVID-19 pandemic and how we can promote the use of

healthy coping strategies. Research should also aim to identify mental health related services

that academic institutions have and how they can be improved upon to meet the specific needs

their students. Research should also focus on exploring gender, and sport-type differences to

clearly understand how the mental health of these groups differ in a pandemic-related context.

Chapter 6.6 - Conclusion

The COVID-19 pandemic led to measures which prevented university students from

being on-campus and attending classes in-person. Consistent with our primary hypothesis,

Canadian university student-athletes reported higher levels of depression, anxiety, stress, and

distress than student non-athletes. There were no gender or sport type differences observed

which contradicts the subsequent hypotheses which believed females and team sport athletes

would report elevated symptoms of depression, anxiety, stress, and distress. There was a

difference between female team sport athletes and female individual sport athletes with

female team sport athletes reporting higher levels of depression, anxiety, stress, and distress.

Future research should aim to understand why these differences did and did not occur and

identify key methods this population used to mitigate and treat mental health disturbances.

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Appendices

Appendix A: Recruitment Script

Good afternoon,

My name is Joshua Celebre, I am a MSc. Applied Health Science Candidate at Brock University. My thesis project aims to identify the mental health status of Canadian university students' and student-athletes' during the COVID-19 pandemic. The reason I am emailing you is in hopes of redistributing my survey to your student population. Below is an outline of my study that will inform your students and student-athletes of the purpose of my study.

Study Title: The COVID-19 Pandemic: A Cross-Sectional Analysis of Canadian University Students' and Student-Athletes' Mental Health
Student Investigator: Joshua Celebre, Master of Science Candidate, Faculty of Applied Health Sciences, Brock University
Faculty Supervisor: Philip Sullivan, Professor, Faculty of Applied Health Sciences, Brock University

You are invited to participate in a study that will aim to identify the mental health status of Canadian students and student-athletes during the COVID-19 pandemic, specifically regarding depression, anxiety, stress, and distress. Student-athletes must be on a team that is in U-Sports or affiliated with U-Sports (i.e., OUA, AUS, RSEQ, and Canada West).

Ideally, results from this study will provide health care professionals and researchers a deeper understanding as to what impact major events can have on the Canadian student population.

If you are willing to participate, we ask that you truthfully complete an online survey.
It will take roughly 10 minutes to complete the questionnaire.

For every 5 participants, 1 Amazon gift card worth $10 will be available to be won in an optional random draw. Winners will be notified via the email address provided in the demographic questionnaire.

Any questions regarding your right as a research participant can be directed to the Brock University Office of Research Ethics.
        905 688-5550 ext. 3035
        reb@brocku.ca

Any questions about the study can be directed to myself, the Student Investigator.
        Joshua Celebre
        Master of Science Candidate, Faculty of Applied Health Sciences, Brock University
        jcelebre@brocku.ca

        Philip Sullivan
        Professor, Faculty of Applied Health Sciences, Brock University
        psullivan@brocku.ca
        905 688-5550 ext. 4787

This study has been reviewed and granted ethics clearance through Brock University's Research Ethics Board: 20 − 248

Below is the link to access the survey:
https://brock.ca1.qualtrics.com/jfe/form/SV_0rAnUk3aD1iTdfE

I look forward to hearing from you,

Joshua Celebre
Brock University
BSc. Medical Science (Honours)
MSc. Applied Health Science (Kinesiology), Candidate

Appendix B: Consent Form

Study Title: The COVID-19 Pandemic: A Cross-Sectional Analysis of Canadian University Students' and Student-Athletes' Mental Health

Student Investigator (PI): Joshua Celebre, Master of Science Candidate
Faculty of Applied Health Sciences
Brock University
jcelebre@brocku.ca

Faculty Supervisor: Philip Sullivan, Professor
Faculty of Applied Health Sciences
Brock University
psullivan@brocku.ca
905 688-5550 ext 4787

Faculty of Applied Health Sciences

Invitation

You are extended an invitation to participate in a study that aims to understand the mental health status of Canadian university students and student-athletes during the COVID-19 pandemic. This study's results can have the ability to provide health care professionals and researchers up-to-date data on the extent of the impact from the COVID-19 pandemic. To be eligible you need to be 18 years of age or older, and currently attending a Canadian university.

What Do You Have To Do?

To participate in this study, you will need to complete a survey. The questionnaire will be online and will take roughly 10 minutes to complete.

Compensation

For every 5 participants, 1 Amazon gift card with a $10 value will be added to an optional prize draw. Winners will be randomly selected upon completion of data collection and announced once data analysis is complete, an estimated date of September 1st, 2021.

Potential Risks

There is a possibility that you will experience negative emotions while completing the involved questionnaires. If you require additional support, please don't hesitate to contact the Student Wellness and Accessibility Services at your university, the Canadian Mental Health Association or Good2Talk.

Brock University Student Wellness and Accessibility Services
https://brocku.ca/health-wellness-accessibility/contact-us/
Call 1-833-276-2533

Canadian Mental Health Association
www.cmha.ca/find-your-cmha
Canada Suicide Prevention Service
Call 1-833-456-4566, available 24/7

Text 45645, available between 4pm and 12am

Good2Talk - Ontario
https://good2talk.ca/contact/
Call 1-866-925-5454
Text GOOD2TALKON to 686868

Good2Talk – Nova Scotia
https://good2talk.ca/contact/
Call 1-833-292-3698
Text GOOD2TALKNS to 686868

Confidentiality

All information gathered will be identified as confidential. No personal identifying information be included in the manuscript, only the data collected from the questionnaires will be used. You will not be identified individually; data will be analyzed as an average.

All data will be stored electronically on a personal device protected by password. Data collected from the questionnaires will be deleted 365 days after publication, whereas email addresses will be deleted once the winners of the Amazon gift cards are announced

To be eligible to win one of the Amazon gift cards your email address will be linked to your data. Your email address will not be used for anything other than the gift card draw and will be deleted once the random draw is complete.

There is no penalty if you wish to withhold your email address.

The collected data will only be accessible by the student investigator, Joshua Celebre, and the faculty supervisor, Philip Sullivan.

Your Participation Is Completely Voluntary

If you want to decline to answer any questions, you may do so. If you wish to withdraw from the study or retract your data, please contact the student investigator. If you withdraw or refuse to answer questions, you will still be eligible to win one of the Amazon gift cards. If you choose to withdraw, you will be asked if the data you submitted can be used or if you would like it to be deleted. You will face no penalties or loss of benefits. You may skip any questions you feel uncomfortable answering.

What Will This Data Be Used For?

The results of this study have the possibility of being published in professional journals and presented at various conferences. Feedback will be available August 2021, and if you want to learn about the outcome of the study, please contact jcelebre@brocku.ca.

Contact Information

If you have any questions regarding the study or want further information prior to participating, please contact Joshua Celebre or Philip Sullivan using the contact information provided above.

Joshua Celebre
jcelebre@brocku.ca

Philip Sullivan
psullivan@brocku.ca

Ethics Clearance

This study has been granted ethics clearance by the Research Ethics Board at Brock University: [ethics file number]. If you have any concerns or questions in regard to your rights as a research participant, please contact the Office of Research Ethics

Office of Research Ethics
905 688-5550 ext 3035
reb@brocku.ca

Consent

By clicking this blue button, I agree to participate in the aforementioned study. I have made this decision based on the information I was given in the Information-Consent Letter. I have been given the opportunity to seek additional details I wanted about the study, and I understand I can ask questions in the future. By agreeing to participate in this study I understand that I am giving my consent, and I have the ability to withdraw this consent at any point in time.

Appendix C: Demographic Questionnaire
1. Please indicate which Canadian university you attended during the 2020/2021 academic year:

    a. Dalhousie
    b. Memorial University of Newfoundland
    c. McGill University
    d. Brock University
    e. Wilfrid Laurier University
    f. University of Windsor
    g. University of Fraser Valley
    h. University of Lethbridge
    i. University of Winnipeg
    j. Other:

2. Please indicate which gender you identify as:
    a. Male
    b. Female
    c. Non-binary / third gender
    d. Prefer not to say

3. Please indicate how you self-identify. If you are of mixed descent, please select all that apply.
    a. Indigenous peoples of Canada (First Nations, Métis, Inuit)
    b. Indigenous (outside of Canada)
    c. Arab
    d. Black
    e. Chinese (including Mainland China, Hong Kong, Macau and Taiwan)
    f. Filipino
    g. Japanese
    h. Korean
    i. Latin, Central, or South American (e.g., Brazilian, Chilean, Columbian, Mexican)
    j. South Asian (e.g., Indian, Pakistani, Sri Lankan, etc.)
    k. Southeast Asian (e.g., Cambodian, Indonesian, Laotian Vietnamese, etc.)
    l. West Asian (e.g., Afghan, Iranian, Syrian, etc.)
    m. White
    n. If none of the above, please specify: _____

4. Do you have any of the following disabilities or ongoing medical conditions that have affected your everyday functioning? (Select all that apply)
    a. Physical disability
    b. Blind/Visually impaired
    c. Deaf/Hard of hearing
    d. Mental health condition
    e. Neurological (learning disability, ASD, Traumatic Brain Injury, ADHD, etc.)
    f. Another condition not listed above
    g. Not applicable – I don't have a disability or ongoing medical condition that affects my everyday functioning
    h. I prefer not to answer

5. Please indicate what year of study you completed during the 2020/2021 academic year:
    a. Undergraduate – Year 1
    b. Undergraduate – Year 2
    c. Undergraduate – Year 3
    d. Undergraduate – Year 4
    e. Undergraduate – Year 5+
    f. Graduate

6. Please indicate your age in years:
    a. 18
    b. 19
    c. 20
    d. 21
    e. 22
    f. 23
    g. 24+

7. How would you describe your living situation during the 2020/2021 academic year?
    a. University residence
    b. Other on-campus housing
    c. Off-campus with family (e.g., parents, spouse/partner, children)
    d. Off-campus alone
    e. Off-campus with friends or roommates
    f. I do not have stable housing (e.g., couch-surfing, living in a vehicle, facing eviction)
    g. I prefer not to say

8. How would you describe your financial situation during the 2020/2021 academic year?
    a. Always stressful
    b. Often stressful
    c. Sometimes stressful
    d. Rarely stressful
    e. Never stressful
9. Please indicate if you experienced any of the following events during the 2020/2021 academic year: (Select all that apply)
    a. Tested negative for COVID-19 without experiencing symptoms
    b. Tested negative for COVID-19 after experiencing symptoms
    c. Tested positive for COVID-19 and followed the isolation protocol
    d. Tested positive for COVID-19 and did not follow the isolation protocol
    e. Not applicable, I did not experience any of these events

10. Prior to the COVID-19 pandemic, were the majority of your courses supposed to be completed online or in-person?
    a. Online
    b. In-person

(If Yes, the participant will be brought to the Debriefing Form)

11. Are you a varsity student-athlete competing in a sport affiliated with U Sport, OUA, AUS, RSEQ or Canada West?
    a. Yes
    b. No

(If Yes, the participant will be brought to question 12)

(If No, the participant will be brought to question 10)

12. Do you compete in a non-varsity sport at a high level?
    a. Yes
    b. No

(If Yes, the participant will be brought to question 11)
(If No, the participant will be forwarded to the Impact of Events Scale – Revised)

13. What level of sport do you compete in?
    a. Regional
    b. Provincial
    c. National
    d. International

(If Regional is selected the participant will be forwarded to the Impact of Events Scale – Revised)
(If Regional is not selected the participant will be brought to the Debriefing Form)

14. Which sport do you compete in? If more than one, please specify.

15. How frequently did you train with your teammates during the 2020/2021 academic year?
    a. Never
    b. Rarely
    c. Sometimes
    d. Often
    e. Always

16. How did you train with your teammates during the 2020/2021 academic year?
    a. Exclusively in-person
    b. Mostly in-person
    c. About the same in-person and virtual
    d. Mostly virtual
    e. Exclusively virtual

17. On average, how frequently did you interact with your teammates during the 2020/2021 academic year?
    a. Never
    b. Rarely
    c. Sometimes
    d. Often
    e. Always

18. How did you interact with your teammates during the 2020/2021 academic year?
    a. Exclusively in-person
    b. Mostly in-person
    c. About the same in-person and virtual
    d. Exclusively virtual

Appendix D: Impact of Events Scale – Revised (Weiss & Marmar, 1996)

Please read each item, and then indicate how distressing each difficulty has been for you **DURING THE PAST SEVEN DAYS** with respect to the **COVID-19 Pandemic**. How much were you distressed or bothered by these difficulties?

"It" refers to the COVID-19 pandemic

The rating scale is as follows:
0 – Not at all
1 – A little bit
2 – Moderately
3 – Quite a bit
4 - Extremely

Any reminder brought back feelings about it	0	1	2	3	4
I had trouble staying asleep	0	1	2	3	4
Other things kept making me think about it	0	1	2	3	4
I felt irritable and angry	0	1	2	3	4
I avoided letting myself get upset when I thought about it or was reminded of it	0	1	2	3	4
I thought about it when I didn't mean to	0	1	2	3	4
I felt as if it hadn't happened or wasn't real	0	1	2	3	4
I stayed away from reminders of it	0	1	2	3	4
Pictures about it popped into my mind	0	1	2	3	4
I was jumpy and easily startled	0	1	2	3	4
I tried not to think about it	0	1	2	3	4
I was aware that I still had a lot of feelings about it, but I didn't deal with them	0	1	2	3	4
My feelings about it were kind of numb	0	1	2	3	4
I found myself acting or feeling like I was back at that time	0	1	2	3	4
I had trouble falling asleep	0	1	2	3	4
I had waves of strong feelings about it	0	1	2	3	4
I tried to remove it from my memory	0	1	2	3	4
I had trouble concentrating	0	1	2	3	4

Reminders of it caused me to have physical reactions, such as sweating, trouble breathing, nausea, or a pounding heart	0	1	2	3	4
I had dreams about it	0	1	2	3	4
I felt watchful and on-guard	0	1	2	3	4
I Tried not to think about it	0	1	2	3	4

Appendix E: Depression-Anxiety-Stress Scale **(**Lovibond & Lovibond, 1996)

Please read each statement and circle a number that indicates how much the statement applies to you **during the 2020/2021 academic year**. There are no right or wrong answers. Do not spend too much time on any statement.

The rating scale is as follows:

0 – Did not apply to me at all
1 – Applied to me to some degree, or some of the time
2 – Applied to me to a considerable degree, or a good part of time
3 – Applied to me very much, or most of the time

I found it hard to wind down	0	1	2	3
I was aware of dryness of my mouth	0	1	2	3
I couldn't seem to experience any positive feelings	0	1	2	3
I experienced breathing difficulty (e.g. excessively rapid breathing, breathlessness in the absence of physical exertion)	0	1	2	3
I found it difficult to work up the initiative to do things	0	1	2	3
I tended to over-react to situations	0	1	2	3
I experienced trembling (e.g. in the hands)	0	1	2	3
I felt that I was using a lot of nervous energy	0	1	2	3
I was worried about situations in which I might panic and make a fool of myself	0	1	2	3
I felt that I had nothing to look forward to	0	1	2	3
I found myself getting agitated	0	1	2	3
I found it difficult to relax	0	1	2	3
I felt down-hearted and blue	0	1	2	3
I was tolerant of anything that kept me from getting on with what I was doing	0	1	2	3
I felt I was close to panic	0	1	2	3
I was unable to become enthusiastic about anything	0	1	2	3
I felt I wasn't worth much as a person	0	1	2	3
I felt that I was rather touchy	0	1	2	3
I was aware of the action of my heart in the absence of physical exertion (e.g. sense of heart rate increase, heart missing a beat)	0	1	2	3
I felt scared without any good reason	0	1	2	3

I felt that life was meaningless   0   1   2   3

Appendix F: Debriefing Form

Thank you for participating in the study conducted by Joshua Celebre, under the supervision of Dr. Philip Sullivan.

Faculty of Applied Health Sciences

The data collected from this study will have the ability to discern the mental health status of Canadian University students and students during the COVID-19 pandemic. This research will provide up-to-date, accurate information to health care professionals, and researchers. Ideally, this can help shape future responses to major events that can benefit our Canadian student population.

All your information and responses to the questionnaires will remain confidential, and we ask that you do not discuss the contents of this study with other students or student-athletes. This is to protect your privacy, as well as others that may have participated or will be participating.

If you have felt an onset of negative emotions and feel the need to seek additional support, please do not hesitate to contact the Student Wellness and Accessibility Centre at your university or locate your regional representative from the Canadian Mental Health Association.

Canadian Mental Health Association
www.cmha.ca/find-your-cmha

Any questions in regard to your right as a research participant can be directed to the Brock Office of Research Ethics.
    905 688-5550 ext 3035
    reb@brocku.ca