

An Exploration of the Relationship between Campus Recreation Usage at Virginia Tech and the
COVID-19 Pandemic

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ABSTRACT

Throughout the pandemic, Virginia Tech Recreational Sports operations were adapted in compliance with federal, state, and local guideline to ensure the safety of the students it serves as a department. Operational adjustments that were made included closures, limited capacities, and virtual programming to name a few. Participation rates in all areas of Virginia Tech Recreational Sports naturally saw a significant decrease during the pandemic due to these restrictions. This project investigated the impact of the COVID-19 pandemic on student engagement in campus recreation, or recreational sports, programs at Virginia Tech with a focus on facility gym swipes, group exercise attendance, and intramural sports involvement spanning three distinct time periods: pre-COVID (T1), during COVID (T2), and post-COVID (T3). Virginia Tech Recreational Sports data uploaded to Virginia Tech's University Data Commons was used to analyze engagement numbers for students at the undergraduate and graduate level across various demographics including academic college, race/ethnicity, and gender. Statistical tests for significance were not able to be completed with the data in this study alone, so the results were only interpreted qualitatively. This study indicates that there has been a gradual return to pre-COVID engagement and participation levels in all areas of Virginia Tech Recreational Sports but the return has been varied across each area. Intramurals appears to have higher involvement post-COVID than pre-COVID, whereas gym swipes and group exercise participation numbers have not returned to pre-COVID levels for most demographics. Return to pre-COVID participation levels varies between academic colleges, race/ethnicity, and gender for all areas. Research plays an integral role in informing decisions and developing strategies that will shape the future of campus recreation. Understanding how student engagement has evolved as a result of the

pandemic can guide programmers within Virginia Tech Recreational Sports, specifically

Director of Rec Sports Ali Cross, to make data-informed decisions for their offerings.

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INTRODUCTION

Campus recreation programs are an integral part of colleges and universities around the world. Not only do campus recreation programs keep students physically healthy and active, but they may also contribute to improved mental health and overall well-being as well as higher grades (Hollmon et al., 2020). This is even more important now that the United States is facing the epidemic loneliness and isolation, which only leads to worse mental health and premature death, according to the Surgeon General (Holt-Lunstad & Golan, 2023). The campus recreation department at Virginia Tech, otherwise known as Recreational Sports or Rec Sports, is committed to offering programs that enhance students' quality of life. Some of the ways Virginia Tech students can engage in physical activity with Rec Sports are through open recreation, fitness, aquatics, intramural sports, sports clubs, and outdoor adventures (Virginia Polytechnic Institute and State University, 2024a).

Participation in most campus recreation programs were trending upward until March 2020, when the COVID-19 pandemic began and disrupted in-person operations of all kinds (A. Cross, personal communication, March 2023). The COVID-19 pandemic significantly impacted the operation of recreation centers and the ability for people to engage in movement. From the pre-COVID era, to the peak of the pandemic, and now post-COVID, there has been remarkable change in Virginia Tech Rec Sports participation data. Understanding how the pandemic guidelines had a significant impact on policy changes regarding recreational activities is crucial in understanding these changes (McNaughtana et al., 2022). Federal, state, and local government laws were enacted at different points to navigate the pandemic to manage the spread of COVID-19. These laws played an important role in determining what in-person campus recreation programs could be offered and in what capacity. Masking, social distancing, and virtual offerings

were just a few of the steps taken by campus recreation departments to be able to continue serving students during the pandemic (“Executive Actions,” n.d.; A. Cross, personal communication, March 2023).

While not always easy to execute, the campus recreation program offerings during the pandemic had extensive positive effects on students in a campus setting (Maher et al., 2021). The literature review of the global health crisis and its effect on campus recreation also shows that the COVID-19 had a massive effect in changing traditional beliefs about fitness activities and intramural sports. As campus recreation leaders and administrators attempt to rebuild their programs to meet and exceed pre-COVID participation numbers, comprehending the link between a campus’ recreational activity and the continually changing settings presented by the pandemic necessitates this investigation.

LITERATURE REVIEW

Campus Recreation

The purpose of campus recreation is to offer faculty, students, and staff with various recreational experiences and opportunities. The commonly offered activities in campus recreation centers are club sports, intramurals, aquatics, outdoor trips, and group fitness (McFayden et al., 2021). One of the challenges with the campus recreation centers is that some students are not aware of the activity choices offered by colleges (Sprung & Rogers, 2021). The lack of awareness leads to differences in participation rates among students. Herbert et al. (2020) conducted a study and found that male students participate in campus recreational activities more than females. Additionally, the study found that new students are also less aware of the recreational options provided in the centers. In this way the Herbert et al. (2020) study supports the implication that the participation rate depends on awareness on the options offered.

Virginia Tech Rec Sports aims to offer recreation activities that allow students to socialize, have fun, and maintain healthy lifestyles (Virginia Polytechnic Institute and State University, 2024a). Leisure activities are effective in improving mental and physical health (Mariotti et al., 2022). Campus recreation is now a crucial component for universities, their students, faculty, and staff since it has become a major marketing and recruiting tool. Universities with outstanding and innovative recreational programs get several awards from the National Intramural-Recreational Sports Association (NIRSA). The Creative Excellence Award for being creative and innovative in marketing programs, and the Outstanding Sports Facilities Award are among the highest awards given by NIRSA (Salvo et al., 2021).

COVID-19 and COVID-19 Rec Sports Policy Changes

COVID-19 is an infectious respiratory illness caused by the SARS-CoV-2 virus. The first case of the infection was registered in Wuhan (China) in December 2019 and quickly spread

all over world resulting in the pandemic (Rugh et al., 2021). However, what drove its spread to such wide proportions is that it is an airborne transmitted virus (Zhao et al., 2022). The virus also had great psychological implications of uncertainties, perception of loneliness, and loss of their loved ones (Pittman et al., 2021). The quarantine imposed on the world and social limits also saw a rise in anxiety and depression rates (Powers et al., 2022).

The state of Virginia initiated various changes to respond to the impact of COVID-19. The state's initial actions involved the implementing control measures. Benner et al. (2020) argued that that statewide lockdowns, social distancing orders, and masks requirements were the measures for controlling the pandemic in the state of Virginia. Vaccination introduction was another measure that was used to manage the pandemic. The COVID-19 vaccines effectively reduced the COVID-19 hospitalizations and mortality rates (McNaughtana et al., 2022). It was also essential for the state to make policy adjustments since aspects of the pandemic kept on changing. According to Holt et al. (2020), policy adjustments ensured a balance between economic recovery and public health. The Virginia State Government considered both sides while implementing and adjusting polices in way that could produce the best results.

COVID-19 laws and restrictions within college campus recreation also show the changes that occurred in the efforts to combat the pandemic. Before the pandemic, colleges operated recreation activities without any restriction. However, closures were implemented after the declaration of COVID-19 as a pandemic in March 2020 (Belayachi, 2022). The closures forced the colleges to transform their academic learning from in-person to online and adopt virtual campus recreation activities. Mitigation measures were also implemented and executed from 2020 to early 2021. A study by Binks et al. (2021) found that some regions allowed institutions to reopen recreation facilities but with strict safety measures. Some believe the beginning of

vaccination efforts is what led to the adoption of hybrid operations in the institutions. These models allowed campus facilities, including academic and recreation buildings, to operate with adjusted hours and limited capacities to manage the strict health and safety protocols (Borowski, 2021). However, it is worth noting that other efforts were necessary to make reopening possible such as social distancing and mask mandates (A. Cross, personal communication, January 12, 2024). These efforts and an increase in the number of vaccinated individuals by summer 2021 resulted to gradual lessening of restrictions. Campus recreation returned to regular operations, but caution and compliance with health protocols remained. Variants that triggered amendments to mitigation measures emerged in the fall of 2021. In some areas, capacity limits, masking requirements and social distancing rules were reinstated in leisure spaces at campuses. The universal vaccination coverage from late 2022 to present also contributed to the removal of restrictions on campus recreation. Facilities are now operating at full capacity and in-person activities have resumed (Kaplan & Milstein, 2021).

The COVID-19 pandemic outbreak affected the campus recreation domain, which was used to facilitate physical well-being and overall development among the students. However, as COVID-19 emerged, it compelled universities to change the existing recreation procedures. The changes were aimed at addressing the various challenges linked to the pandemic (Kuss et al., 2022). One of the most innovative solutions that were subsequently implemented were the adoption of virtual and remote fitness programs. According to Daum et al. (2022), universities used technology in organizing online workout and wellness sessions. Strict health and safety protocols were also applied in the campus recreation centers to facilitate their gradual reopening (Singh et al., 2021). These measures were implemented to help achieve the balance between ensuring students have access to recreational resources and minimizing virus transmission

(Gould, 2020). Outdoor recreation also emerged as another practical healthy coping mechanism during the pandemic (Mustapha et al., 2021). Campuses made outdoor spaces multifunctional areas for yoga classes, group exercises and recreational sports. According to Jackson et al. (2021), the outdoor spaces were effective as they adhered to public health guidance and reflected facilities' ability to adapt during challenges.

Virginia Tech Rec Sports followed federal, state, and local laws to navigate facility and programming operations throughout the pandemic. All operations were put on hold for the rest of the spring semester after spring break in March 2020. Rec Sports facilities were able to reopen on June 22, 2020, with limited hours and restrictions following Virginia Department of Health's Safer at Home Phase 2 guidelines. Occupancy in the facility was limited to only 8% at this time, so creativity with virtual programming was necessary. Phase 3 of the Safer at Home guidelines was issued by Fall 2020, which allowed the Rec Sports facility capacity to increase to 20%. Members were asked to pre-sign up for spots in the facility to manage the limited capacity at this time and were required to wear masks throughout the facility and during activity. In-person programming returned but still with limited capacity and heavy reliance on virtual options. Policies and restrictions intended to mitigate the spread of COVID-19 continued to be adjusted and implemented the entire next year all the way through the end of the Spring 2022 semester. Necessary measures during this time obviously took a toll on participation numbers, so the goal since Summer 2022 when operations were able to return to somewhat normal, has been to rebuild participation numbers back to where they were before the pandemic (A. Cross, personal communication, February 2024). Table 1 shows how Virginia Tech Recreational Sports operation policies changed semester to semester due to COVID-19 (A. Cross, personal communication, March 2024; Z. Worrell, personal communication, April 2024).

Table 1. COVID-related Recreational Sports Operation Policies.

Academic Semester	COVID-Related Recreational Sports Operation Policy Changes
Spring 2020	<ul style="list-style-type: none"> - All operations and programming paused starting March 16 after Spring Break
Summer 2020	<ul style="list-style-type: none"> - McComas Hall open for general exercise use with limited hours starting June 22 - Building occupancy limited to 8% - In-person group exercise class capacity limited to 15 people - Indoor sports activities paused - Field House closed - Venture Out closed - Masks required at all times
Fall 2020	<ul style="list-style-type: none"> - Building occupancy limited to 20% - In-person group exercise class capacity limited to 15 people (compared to 55) - Field House open for walk-up open recreation volleyball, pickleball and badminton as well as scheduled reservations - Intramural Sport offerings include: badminton, pickleball, volleyball, kickball, softball as well as several self-report leagues - Venture Out Center closed to walk-in traffic - Masks required at all times
Spring 2021	Fall 2020 policies continued with the following additions: <ul style="list-style-type: none"> - Building capacity and group size limits adjusted monthly based on the governor’s current executive order - Venture Out Center opened for bouldering with small groups of 8 people - Open recreation basketball in the Field House with pre-registration starting April 18
Summer 2021	Continue all activities offered in Spring 2021 <ul style="list-style-type: none"> - Masks are optional for vaccinated individuals
Fall 2021	<ul style="list-style-type: none"> - Group exercise capacity limited to 30 people - No intramural restrictions - No Venture Out restrictions
Spring 2022	<ul style="list-style-type: none"> - Group exercise capacity limited to 40 people
Fall 2022	No restrictions – operational policies return to pre-COVID

Fitness Centers, Group Exercise, and Intramurals

Fitness centers have seen significant growth in popularity since the 1970s (Andreasson & Johansson, 2014, p. 92). Sassatelli (1999) differentiates fitness centers from traditional bodybuilding gyms that have been popular since the beginning of the 20th century, with the

difference being that fitness gyms allow for different training methods employed and a diverse population of people to participate. He also notes that time spent in fitness centers is less focused on competition than traditional bodybuilding gyms and is considered leisure. On college campuses such as Virginia Tech, fitness and recreation centers give students a place with many different opportunities to be physically active as a leisure activity (Virginia Polytechnic Institute and State University, 2024a). Virginia Tech Recreational Sports' primary recreation center on campus is McComas Hall, which includes weight training areas, cardio equipment, basketball and volleyball courts, group fitness studios, a pool, and an indoor track (Virginia Polytechnic Institute and State University, 2024d). However, Virginia Tech Recreational Sports owns several other facilities that offer students the opportunity to be physically active. The other relevant Rec Sports facilities for this study are War Memorial Hall, the Field House, and Venture Out. War Memorial Hall was the other large gym on campus, in addition to McComas Hall, until the end of the March 2020 when it closed with the rest of the Rec Sports facilities because of the pandemic and has stayed closed for renovations that are still in progress (Z. Worrell, personal communication, March 2024). The Field House was built in the summer of 2020 to offset the loss of War Memorial Hall and offers a weight room as well as five full courts where many intramural sports are played, and open recreation takes place. Venture Out opened in January of 2021 to provide students with outdoor recreation programs, a rock-climbing wall, and the ability to rent equipment (Virginia Polytechnic Institute and State University, 2024c).

Group exercise is an offering in many fitness centers that can be traced back to the late 1960s when the concept of aerobic exercise was introduced and Jazzercise was invented, according to Wing (2014). She explains that the essence of Jazzercise, which involves an instructor leading a group of people through cardio, strength, and stretching movements, is the

foundation for all other forms of group exercise classes that exist today. Participation in group exercise is of great importance to college students. According to Maher et al. (2021), group-based fitness programs lead to the improvement of cardiovascular wellbeing and psychological functioning. It has a social aspect that promotes unity and lasting commitment among students. Research done by Harden et al. (2015) provides further evidence that group dynamics-based physical activity programs have the potential to have a positive impact on physical activity habits and behavior change, specifically if the group interacts and identifies as a unit. However, their research also identifies that there is a gap in what is known about strategies that work best for particular contexts and populations (Harden et al., 2015). At Virginia Tech, over 100 group exercise classes are offered on campus each week during the Fall and Spring semesters with a variety of formats ranging from bootcamp to yoga, cycling, cardio dance, and more (Virginia Polytechnic Institute and State University, 2024). In-person group exercise classes continued at Virginia Tech throughout the pandemic with limited capacities to ensure social distancing guidelines were upheld, and these classes were also able to be joined virtually via Zoom (Z. Worrell, personal communication, August 2022).

Another extension of most fitness and recreation centers on college campuses is intramural sports program offerings (Rothwell & Theodore, 2006). Intramural activities are unique in the sense that all of the people who participate are members of the same institution that is running the given activity (Colgate, 1978, p. 1). For example, to participate in intramurals at Virginia Tech, one must be affiliated with the university as a student or employee. Not only does participating in intramurals give people a fun way to stay active, but it also helps students improve their leadership and teamwork skills (Belcher et al., 2021). The intramural offerings at Virginia Tech are extensive from pickleball to flag football, sand volleyball, innertube water

polo, and more (Virginia Polytechnic Institute and State University, 2024). There are two different categories of intramural sports at Virginia Tech, which are team sports and self-report activities in which individuals participate solo or in groups of two (M. Woods, personal communication, April 2024). Table 2 shows the team sports and self-report sports that were offered in the 2019-2020 and 2022-2023 academic years, which were the two time periods considered for this study (C. Stridsberg, personal communication, April 2024).

Table 2. Intramural program offerings at Virginia Tech pre-COVID and post-COVID.

Academic Year	Intramural Offerings
2019-2020 (pre-COVID)	Team Sports: <ul style="list-style-type: none"> - Soccer - Flag Football - Volleyball - Basketball - Dodgeball - Battleship - Sand Volleyball - Wallyball - Innertube Water Polo - Softball* - Indoor Soccer* - Ultimate Frisbee* *Activity not offered due to the COVID-19 pandemic Self-Report: <ul style="list-style-type: none"> - Basketball Singles - Sand Volleyball Doubles - Tennis Singles & Doubles - Golf Singles - Bowling Singles - Racquetball Singles & Doubles - Disc Golf Singles - Darts Singles & Doubles - Badminton Doubles - Sports Trivia
2022-2023 (post-COVID)	Team Sports: <ul style="list-style-type: none"> - Soccer - Flag Football - Basketball - Volleyball - Softball - Kickball

	<ul style="list-style-type: none"> - Ultimate Frisbee - Handball - Sand Volleyball - Dodgeball - Battleship - Innertube Water Polo <p>Self-Report:</p> <ul style="list-style-type: none"> - Pickleball Doubles - Spikeball Doubles - Sand Volleyball Doubles - Tennis Singles & Doubles - Badminton Singles & Doubles - Table Tennis Singles - Golf Singles - Basketball Singles - Disc Golf Singles - Sports Trivia
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Recently, there have been various changes in group exercise and intramurals trends. Technological integration is one of the trends. According to Humphries et al. (2021), contemporary group exercise and intramurals integrate fitness apps, virtual classes, and gamification elements to enhance accessibility and participant experience. Technological incorporation in the group exercise and intramurals is used to enhance inclusivity in the campus setting. However, offering intramural and group exercises involve various challenges that relate to providing adequate athletic facilities and varying fitness levels among participants. Hartman et al. (2020) suggested that these challenges can be addressed through a holistic approach that focuses on inclusivity.

Technology & Virtual Programming

A study by Cox et al. (2019) showed that technology plays a transformative role in improving student engagement activities. The results of this study indicate that the university campus represents an innovative and technologically knowledgeable space, able to digitally deliver information to meet the needs of the learners by offering technology equipment educators

and programmers can use. According to Balasuriya et al. (2022), technology infusion also contributes to the success of setting up an experience that is inclusive and participatory. Additionally, technology continues to shape the culture and the experiences people have (Balasuriya et al., 2022). Thus, universities should be open to adopting current technological advances to address the challenges arising in the recreation sector.

The efforts to continue group exercise programming at Virginia Tech Rec Sports during the pandemic were possible because of technological advances. Group exercise classes held on campus were offered virtually via Zoom in the Fall 2020 semester since capacity was limited and many people did not feel comfortable coming to workout in person at this point. Offering group exercise classes on Zoom also allowed classes to be recorded and uploaded to an on-demand group exercise library. In the Post-pandemic era, in-person group exercise capacities are back to 100%, with all classes continuing to offer a Zoom option, with recordings uploaded to the on-demand library (A. Cross, personal communication, February 12, 2024).

Conclusion

Like the rest of the world, campus recreation operations have undergone significant transformations as a result of the COVID-19 pandemic. From the abrupt closures of facilities to the gradual reintroduction of in-person activities with strict health protocols, the pandemic has forced universities, including Virginia Tech, to adapt unprecedented challenges. This literature review has provided insights into the multifaceted impact of COVID-19 on campus recreation, highlighting shifts in participation trends, policy changes, and the innovative measures undertaken to navigate these unprecedented times.

As we look ahead to the future of campus recreation, it is important to recognize the role that research plays in informing strategies for rebuilding and advancing these programs. This

research project aims to dive deeper into how trends within campus recreation at Virginia Tech have evolved and recovered in response to the pandemic. The purpose of the project is to examine student participation in campus recreation at Virginia Tech before, during, and after the COVID-19 pandemic. The project aims to identify and analyze the trends within campus recreational facilities and programming during these distinct periods. Specifically, undergraduate student participation in group exercise and intramural sports will be compared alongside general entry into the facility during each of these time periods. Data among different demographics including gender, academic college, and residential status of on- or off-campus will also be addressed. By gaining insight into how the pandemic has influenced patterns of engagement and participation numbers, this project aims to provide valuable information for the enhancement and adaptation of campus recreation offerings.

The findings of the project can be used by campus recreation professionals, specifically the Director of Rec Sports at Virginia Tech Ali Cross, to navigate the post-pandemic landscape effectively. Ultimately, the goal of this project is to contribute to the optimization of campus recreation experiences, ensuring that they align with the evolving needs and preferences of Virginia Tech students. By understanding the impact of the COVID-19 pandemic on campus recreation, the project aims to inform future planning and decision-making processes, fostering a resilient and adaptive campus recreation environment.

METHODS AND MATERIALS

Overview

This cross-sectional study analyzed student participation in Rec Sports programs including usage of the facilities through gym swipes, group exercise class attendance, and intramural sport participation. For each of the three areas, comparisons were made between three time periods: pre-COVID (T1), during COVID (T2), and post-COVID (T3). For facility gym swipes, T1 was defined as the 2018-2019 academic year, T2 was defined as the 2020-2021 academic year, and T3 was defined as the 2022-2023 academic year. This included data from all terms within the academic year including summer, winter, spring, and fall. Available data for group exercise attendance and intramural sport participation did not go as far back as gym swipes, so T1 had to be defined differently for group exercise and intramurals. For these two areas, T1 was defined as the 2019-2020 academic year. T2 and T3 were defined the same as gym swipes for group exercise and intramurals, which were 2020-2021 and 2022-2023, respectively.

Gym swipes into all Rec Sports facilities including McComas Hall, War Memorial Hall, the Field House, and Venture Out are tracked using a rec management software called Fusion. The Fusion software was developed and is owned by InnoSoft Canada Inc. located in London, Ontario (InnoSoft Canada Inc., 2024). This is the software that is also used to track in-person group exercise class attendance for Virginia Tech Rec Sports. Fusion recognizes student ID numbers, which provide valuable details including student participants' academic college, race/ethnicity, gender, and academic standing as an undergraduate or graduate student. Intramural sport registration is collected in an online system called IMLeagues, which is a company located in Raleigh, North Carolina (IMLeagues, 2024). Just like Fusion, student

registration through IMLeagues is associated with their Virginia Tech student ID, which provides details about the individuals participating in intramural sports.

For this study, analytics about gym swipe data and group exercise data from Fusion as well as intramural sports data from IMLeagues were viewed in Virginia Tech's University Data Commons (UDC). The UDC is the university's very own data analytics platform managed in Blacksburg, Virginia (Virginia Polytechnic Institute and State University, 2024b). The data needed for this study were under the Student Affairs app within the UDC, which was categorized as a "VT Authorized User" app meaning additional authorization was required before moving forward (Virginia Polytechnic Institute and State University, 2024b). UDC Support was contacted to be granted access, so data collection could begin.

Data within the UDC was collected for unique student gym swipes into any Rec Sports facilities including the Field House, McComas Hall, Venture Out, and War Memorial Hall were collected for each of the defined time periods: T1, T2, and T3. Unique students means each person who swiped into a Rec Sports facility is only counted one time regardless of how many facilities they visited and how many times they swiped into each one throughout the academic year.

Measures

First, the total number of all unique student gym swipes and percent of the student population represented was collected. The percent of students reflected by the unique swipe number was calculated by the UDC using all students enrolled in the Blacksburg campus as the total population. Students enrolled at other campuses or enrolled virtually were not included in the total population but are included in the unique swipes. Then, using the filters available in the UDC, unique student swipes for each academic year were then separated out by academic

college, race/ethnicity, and gender. The academic colleges included in this study were the College of Agriculture and Life Sciences the College; the College of Architecture, Arts, and Design; Pamplin College of Business; the College of Engineering; the College of Liberal Arts and Human Sciences; the College of Science; the College of Veterinary Medicine; and the College of Natural Resources and Environment. The race/ethnicity categories included in this study were American Indian or Alaska Native, Asian, Black or African American, Hispanics of any race, Native Hawaiian or Other Pacific Islander, Nonresident Alien, Two or more races, Unknown, and White. The categories of gender included were Female, Male, and Unknown.

A variety of descriptive statistics were used to identify any potential themes between the different time periods for gym swipe data. First, the change in percent of students from T1 to T2 was calculated for each category including all students, each academic college, each race/ethnicity, and each gender. The change in percent of students from T2 to T3 was calculated next. Lastly, the difference in percent of students from T1 was compared to the percent of students in T3 to gauge recovery or lack thereof. This was calculated by subtracting the T3 percent from the T1 percent. A difference ≥ 0 indicates recovery, and a negative difference indicates a lack thereof. Bar charts of all these descriptive statistics were created for visual representation.

Group exercise data and intramural data were collected separately but followed the same procedures, except that no data was available prior to the 2019-2020 year. Like gym swipes, only unique students were considered, meaning each student is only recorded once in each category regardless of how many group exercise classes they took or how many intramural sports they participated in. The percent of students who engaged with Rec Sports through either group exercise or intramurals was calculated by and collected from the UDC. Percent difference

between T1 (defined differently here due to lack of data for the 2018-2019 year) and T3 was the main comparisons for group exercise and intramurals because programming for these areas was very limited during T2. The same categories were included for group exercise and intramurals as the ones used for gym swipes. First all students were included and then data was broken down into the eight academic colleges, nine race/ethnicity identities, and three gender identities. The difference in percent of students in T3 compared to T1 was put into separate bar charts for academic colleges, races/ethnicities, and genders as a visual representation of the recovery or lack thereof for both group exercise and intramural data. Like gym swipes, a percent difference ≥ 0 indicates recovery back to or beyond pre-COVID participation and a negative difference indicates that recovery has not occurred because it was calculated by subtracting the T1 percent from the T3 percent.

RESULTS

Recreational Sports Facility Gym Swipes

Figure 1 below shows the total number of unique students who swiped into any Rec Sports facility, which includes all academic colleges, races, and genders. 23,685 (70.3%) unique students swiped in T1, 14,472 (50.8%) unique student swiped in T2, and 23,119 (62.7%) unique students swiped in T3 into a Rec Sports facility for the 2018-2019; 2020-2021; and 2022-2023 academic years, respectively. See Figure 1.

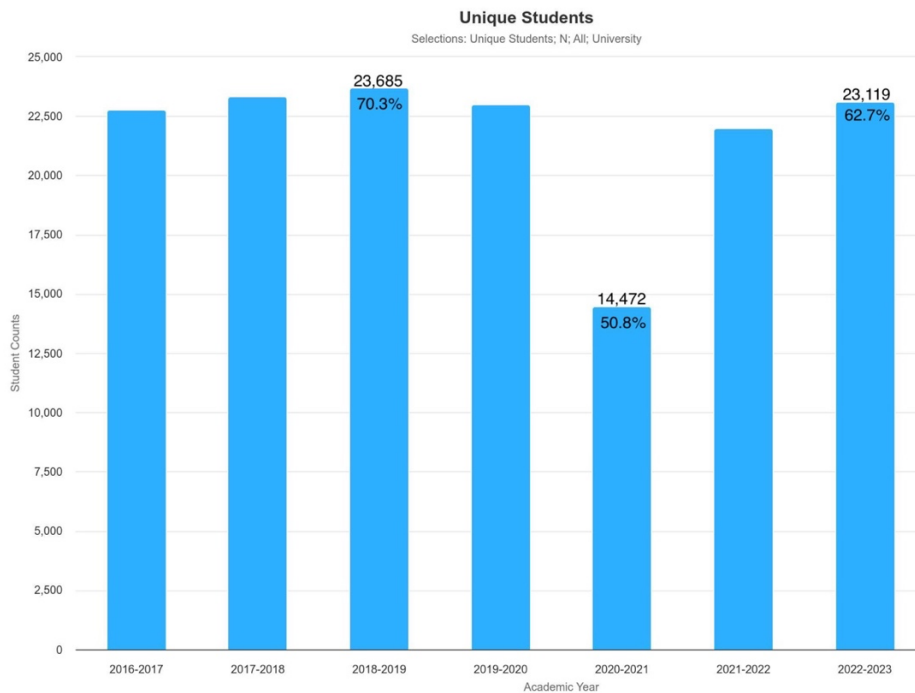


Figure 1. Total number of unique student gym swipes into any Rec Sports facility in the 2018-2019, 2020-2021, and 2022-2023 academic years and the percent of students represented.

The changes in percentages between time periods for all student gym swipes are shown below in Figure 2. From left to right, the percent change from T1 to T2 was -19.5%, the change from T2 to T3 was 11.9%, and the difference in percent between T1 and T3 was -7.6%.

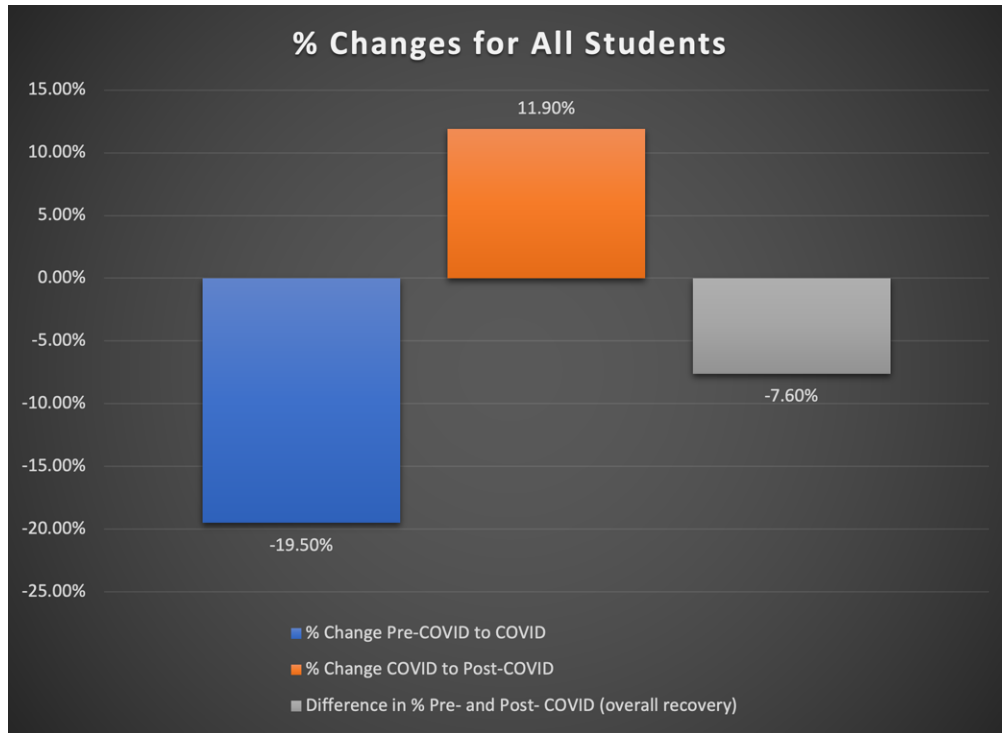


Figure 2. Changes in percentages for all student gym swipes into any Rec Sports facility.

Table 3 shows the number of unique students from each academic college, race/ethnicity, and gender who swiped into a Rec Sports facility at least one time in each time period and the percent of students represented. Figure 3 shows the change in percent usage for each academic college from T1 to T2. Figure 4 shows the change in percent usage for each of the academic colleges from T2 to T3. Figure 5 shows the difference in percent from T1 to T3, or the overall recovery, for each academic college.

AN EXPLORATION OF THE RELATIONSHIP BETWEEN CAMPUS RECREATION 25 USAGE AT VIRGINIA TECH AND THE COVID-19 PANDMEIC

Table 3. Number of unique students who swiped into a Rec Sports facility during each time period and the percent of students represented.

	T1 unique #	T1 %	T2 unique #	T2 %	T3 unique #	T3 %
All students	23,685	70.30%	14,472	50.80%	23,121	62.70%
ACADEMIC COLLEGE						
College of Agriculture and Life Sciences	2,250	71.00%	1,449	52.00%	2,138	65.00%
College of Architecture, Arts, and Design	963	64.60%	590	43.70%	922	54.70%
Pamplin College of Business	3,850	80.80%	2,669	83.60%	4,270	73.20%
College of Engineering	7,959	72.50%	4,850	47.60%	7,957	62.10%
College of Liberal Arts and Human Sciences	3,332	72.40%	2,090	52.30%	3,147	63.90%
College of Science	3,816	76.10%	2,228	50.90%	3,752	65.80%
College of Veterinary Medicine	344	55.10%	213	29.70%	480	49.60%
College of Natural Resources and Environment	812	68.80%	432	38.40%	687	57.20%
RACE						
American Indian or Alaska Native	28	60.90%	10	29.40%	21	52.50%
Asian	2,368	77.70%	1,540	61.60%	2,890	70.00%
Black or African American	1,032	73.30%	679	54.30%	1,365	67.00%
Hispanics of any race	1,555	74.20%	1,217	57.40%	2,212	67.70%
Native Hawaiian or Other Pacific Islander	28	93.30%	16	84.20%	27	87.10%
Nonresident Alien	2,493	65.90%	788	29.30%	1,827	47.90%
Two or more races	1,091	73.00%	758	56.10%	1,184	66.30%
Unknown race	479	66.30%	271	47.00%	502	67.60%
White	14,611	69.40%	9,193	51.20%	13,093	62.20%
GENDER						
Female	10,198	70.50%	6,147	48.90%	9,690	61.30%
Male	13,450	70.30%	8,303	52.40%	13,385	63.90%
Unknown gender	37	47.40%	22	22.70%	46	45.10%

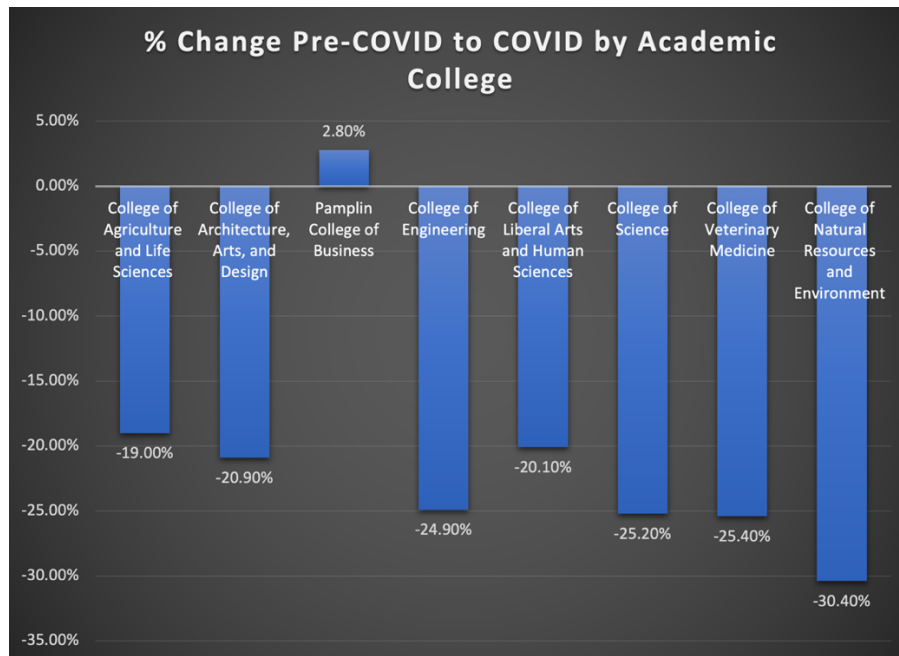


Figure 3. Change in percent of students from each academic college who swiped into a Rec Sports facility from T1 (2018-2019) to T2 (2020-2021).

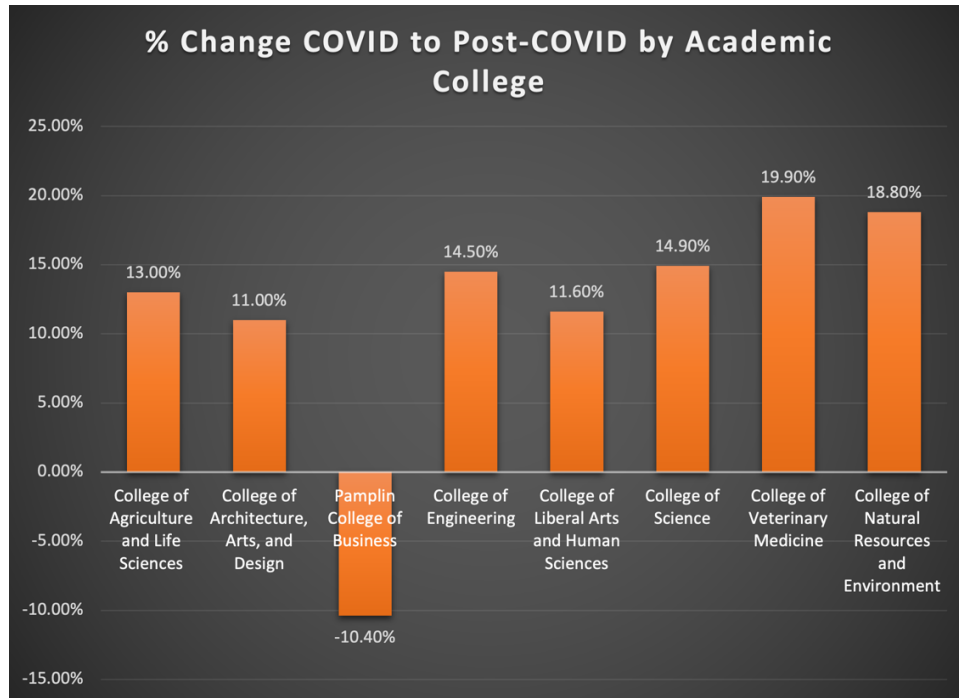


Figure 4. Change in percent of students from each academic college who swiped into a Rec Sports facility from T2 (2020-2021) to T3(2022-2023).

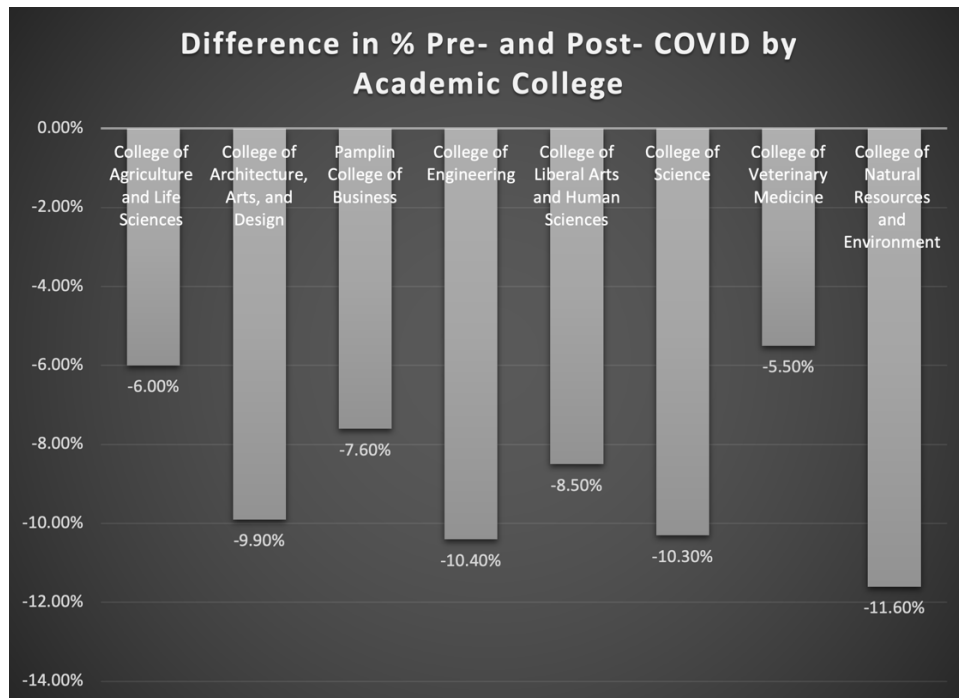


Figure 5. Difference in percent of students from each academic college who swiped into a Rec Sports facility T1 (2018-2019) compared to T3 (2022-2023).

Figure 6 shows the change in percent usage for each of the ethnicities from T1 to T2.

Figure 7 shows the change in percentage usage for each of the ethnicities from T2 to T3. Lastly for race/ethnicity, Figure 8 shows the difference in percent usage in T1 compared to T3, or overall recovery.

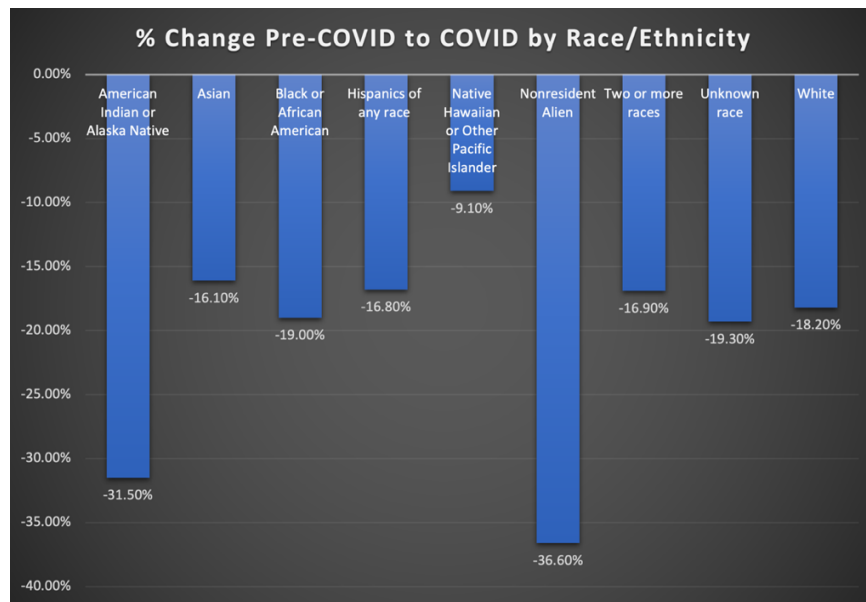


Figure 6. Change in percent of students from each race or ethnicity who swiped into a Rec Sports facility from T1 (2018-2019) to T2 (2020-2021).

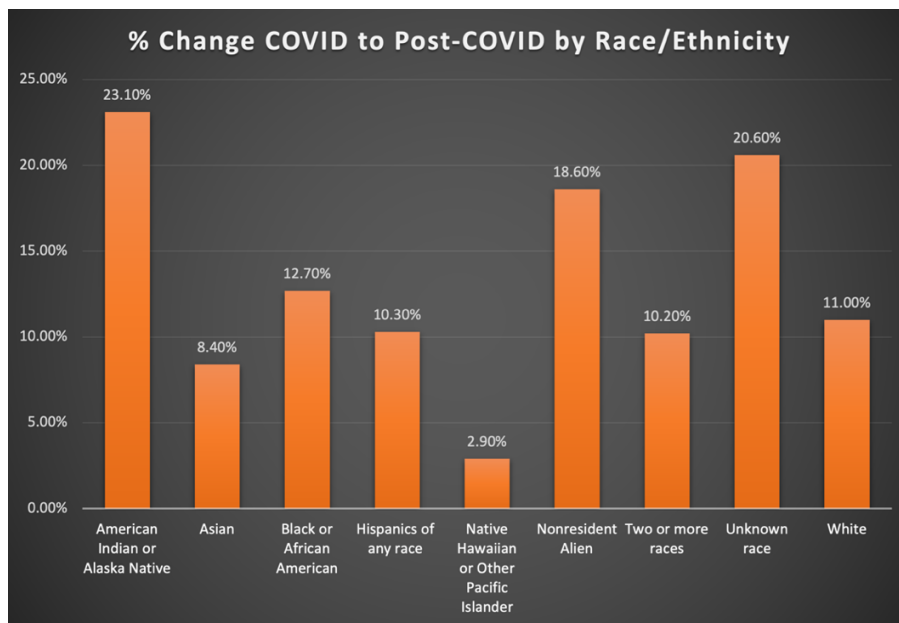


Figure 7. Change in percent of students from each race or ethnicity who swiped into a Rec Sports facility from T2 (2020-2021) to T3 (2022-2023).

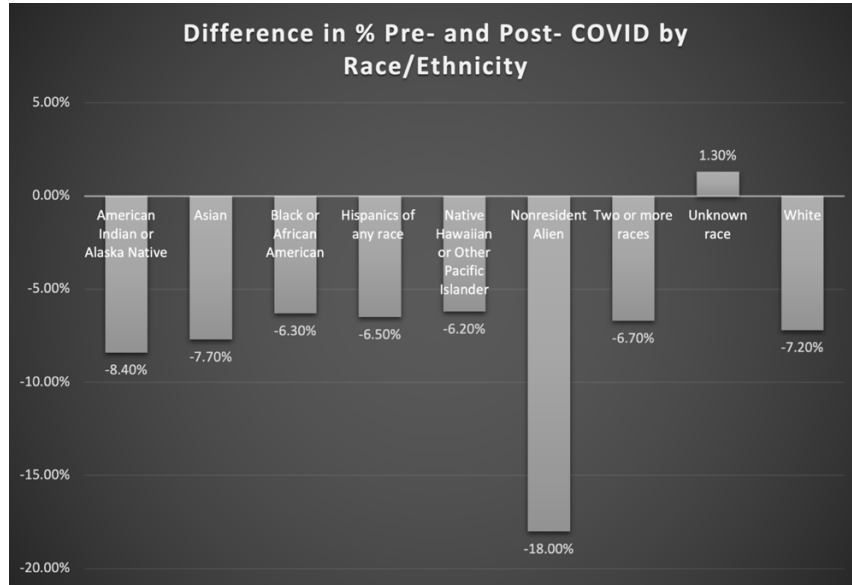


Figure 7. Difference in percent of student from each race or ethnicity who swiped into a Rec Sports facility T1 (2018-2019) compared to T3 (2022-2023).

Figure 9 shows the change in percent usage for each gender from T1 to T2. Figure 10 shows the change in percent usage for each gender from T2 to T3. The difference between percent usage by gender T1 compared to T3, or overall recovery, is shown in Figure 11.

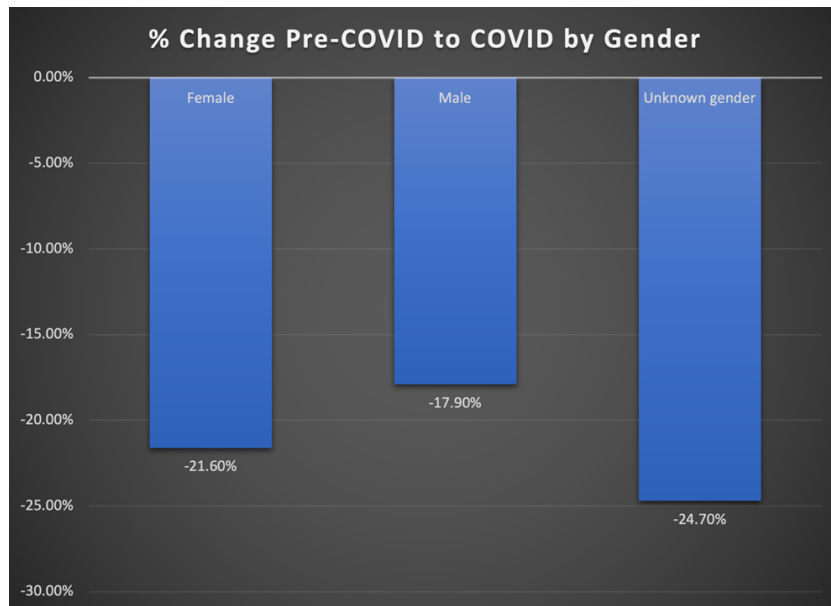


Figure 9. Change in percent of students who swiped into a Rec Sports facility from T1 (2018-2019) to T2 (2020-2021) broken down by gender.

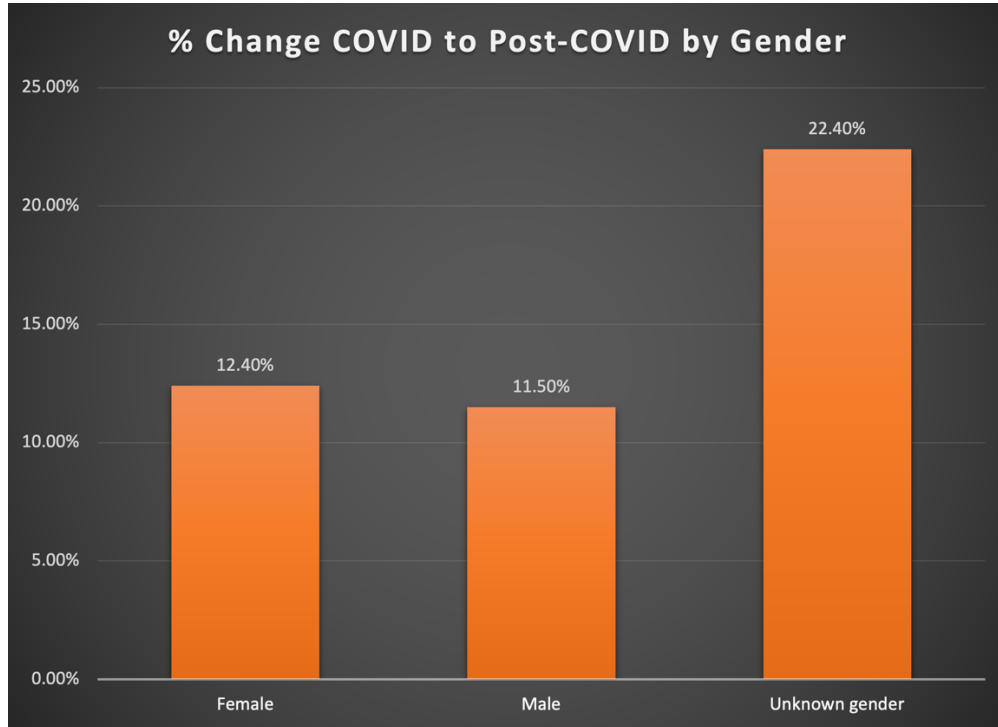


Figure 10. Change in percent of students who swiped into a Rec Sports facility from T2 (2020-2021) to T3 (2022-2023) broken down by gender.

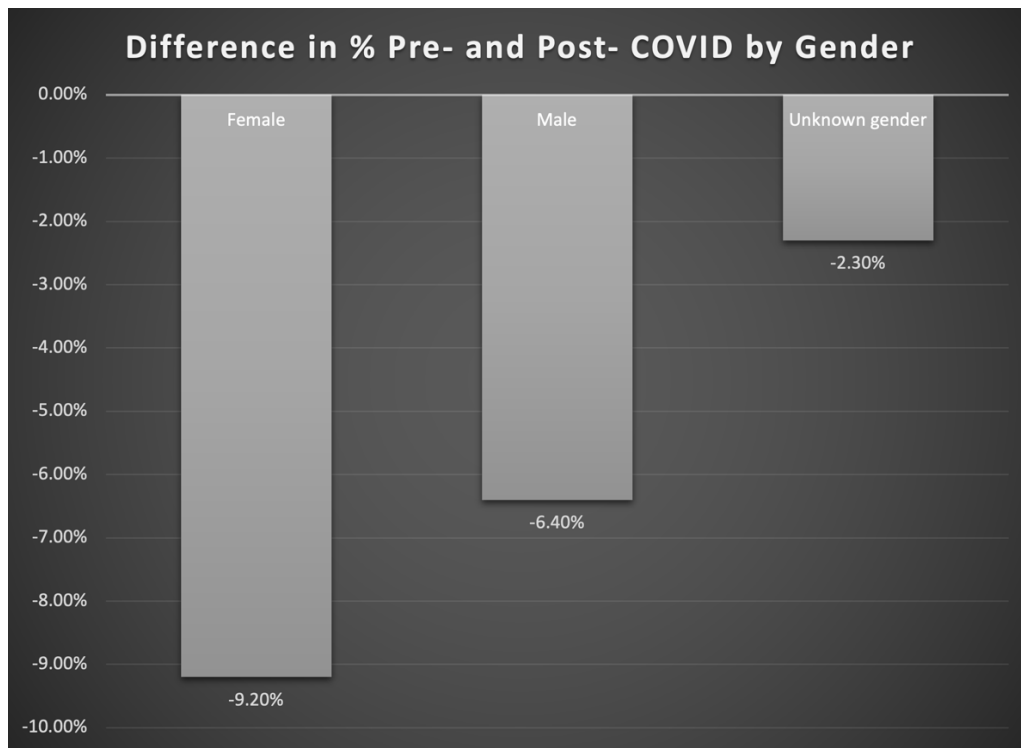


Figure 11. Difference in percent of students who swiped into a Rec Sports facility T1 (2018-2019) compared to T3 (2022-2023) broken down by gender.

Group Exercise (GX)

The percent of students who attend group exercise in T1 (2019-2020) compared to the percent of student who attended group exercise in T3 (2022-2023) was the next set of data collected. 11.3% of all students at the university, including all academic colleges, races/ethnicities, and genders, attended a group exercise class at least once in T1. In T2, 8.6% of all students were reported for group exercise attendance. There is a -2.7% difference in the percent utilization number for group exercise T3 versus T1.

Table 4 shows the unique number of students and percent of students from each academic college, race/ethnicity, and gender who attended group exercise in T1 and T3. The difference in percent between T1 and T3 utilization, or overall recovery, for each academic college, race/ethnicity, and gender is shown in Figure 12, 13, and 14 respectively.

Table 4. Unique number of students and percent of students from each category who attended group exercise during T1 (2019-2020) and T3 (2022-2023).

	T1 unique #	T1 %	T3 unique #	T3 %
All students	3,955	11.30%	3,168	8.60%
ACADEMIC COLLEGE				
College of Agriculture and Life Sciences	549	20.40%	470	14.30%
College of Architecture, Arts, and Design	197	10.30%	152	9.00%
Pamplin College of Business	622	12.60%	627	10.70%
College of Engineering	734	6.20%	541	4.10%
College of Liberal Arts and Human Sciences	814	16.90%	654	13.30%
College of Science	785	13.60%	575	10.00%
College of Veterinary Medicine	88	13.40%	90	9.30%
College of Natural Resources and Environment	117	10.10%	77	6.40%
RACE				
American Indian or Alaska Native	2	4.40%	2	5.00%
Asian	312	9.50%	283	6.90%
Black or African American	119	8.00%	133	6.50%
Hispanics of any race	262	11.40%	279	8.50%
Native Hawaiian or Other Pacific Islander	5	16.70%	2	6.50%
Nonresident Alien	203	5.10%	123	3.20%
Two or more races	192	12.10%	152	8.50%
Unknown race	77	11.20%	61	8.20%
White	2,783	12.80%	2,133	10.10%
GENDER				
Female	3,580	23.80%	2,832	17.90%
Male	371	1.90%	332	1.60%
Unknown gender	4	4.00%	4	3.90%

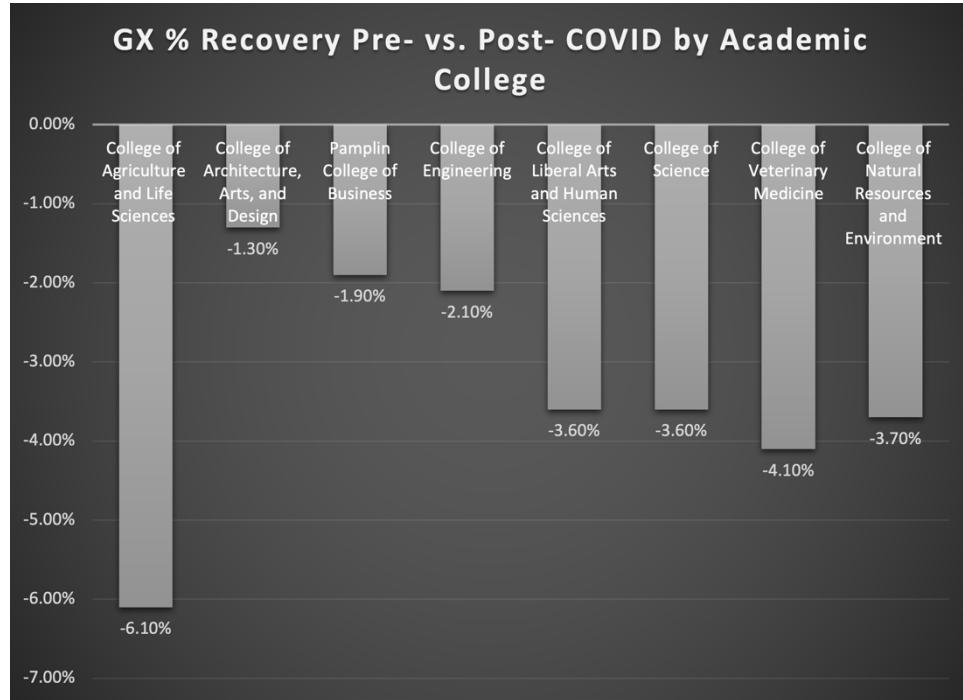


Figure 12. The difference in percent for group exercise attendance in T1 vs. T3, or overall recovery, broken down by academic college.

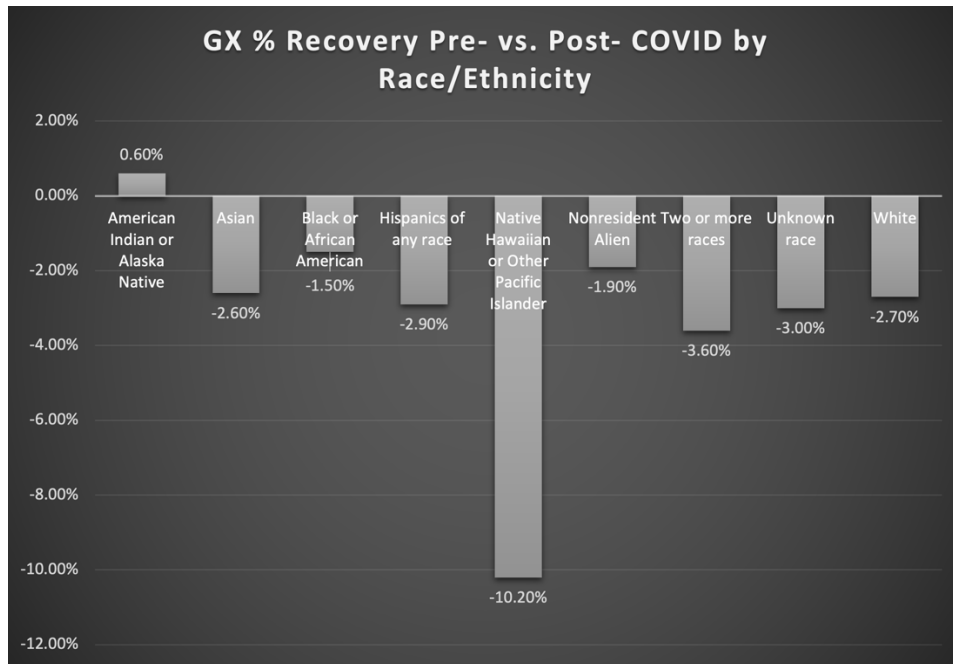


Figure 13. Difference in percent of students T1 vs. T3, or overall recovery, for group exercise broken down by race/ethnicity.

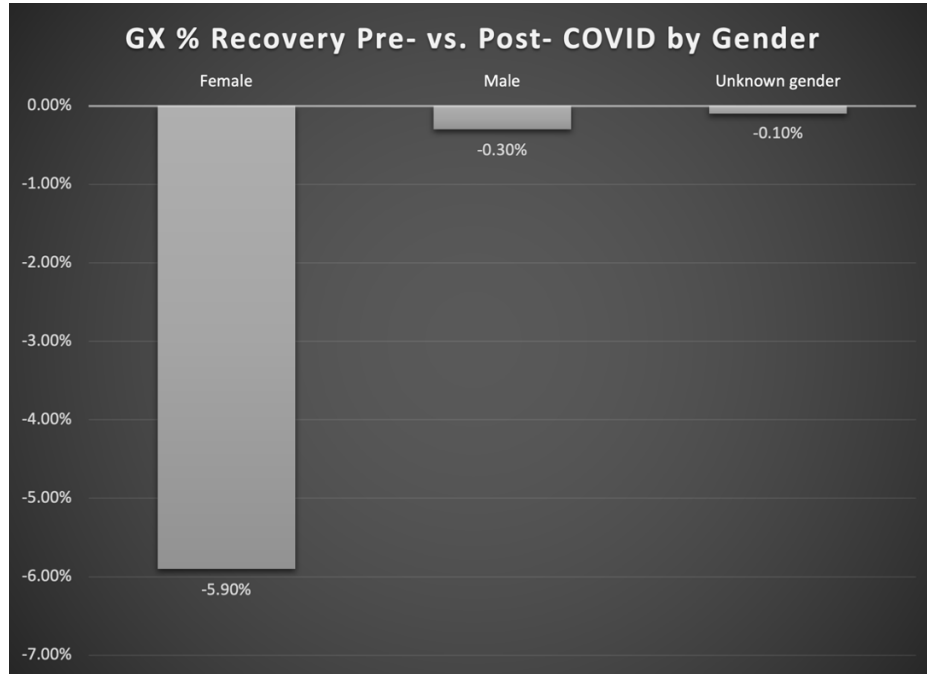


Figure 14. Difference in percent of students who attended group exercise in T1 vs. T3 broken down by gender.

Intramurals (IM)

The last set of data to be collected was the percent of students who participated in an intramural sport during T1 (2019-2020) and T3 (2022-2023). The percent of all students who participated in intramurals was 18.0% in T1 and 19.2% in T3. The difference in percent of students between these two time periods is 1.2%.

The percent of students from each academic college, race/ethnicity, and gender who participated in intramurals in T1 and T3 was then collected. These percentages are shown in Table 5. The differences in percent for each academic college, race/ethnicity, and gender between T1 and T3, or overall recovery, are shown in Figure 15, 16, and 17 respectively.

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Table 5. The unique number of students and percent of students from each category who participated in intramurals in T1 (2019-2020) and T3 (2022-2023).

	T1 unique #	T1 %	T3 unique #	T3 %
All students	6,293	18.00%	7,065	19.20%
ACADEMIC COLLEGE				
College of Agriculture and Life Sciences	541	17.60%	614	17.50%
College of Architecture, Arts, and Design	407	18.10%	235	13.90%
Pamplin College of Business	1,271	25.70%	1,747	29.90%
College of Engineering	2,236	19.80%	2,415	19.10%
College of Liberal Arts and Human Sciences	625	13.20%	772	15.70%
College of Science	814	14.60%	928	16.40%
College of Veterinary Medicine	82	12.40%	133	13.80%
College of Natural Resources and Environment	185	16.00%	206	17.20%
RACE				
American Indian or Alaska Native	5	11.10%	6	15.00%
Asian	595	18.10%	729	17.70%
Black or African American	205	13.80%	327	16.10%
Hispanics of any race	453	19.80%	703	21.50%
Native Hawaiian or Other Pacific Islander	7	23.30%	11	35.50%
Nonresident Alien	262	6.60%	218	5.70%
Two or more races	284	17.90%	326	18.30%
Unknown race	131	19.00%	157	21.10%
White	4,351	20.10%	4,588	21.80%
GENDER				
Female	1,665	11.10%	1,925	12.20%
Male	4,618	23.20%	5,131	24.50%
Unknown gender	10	9.90%	9	8.80%

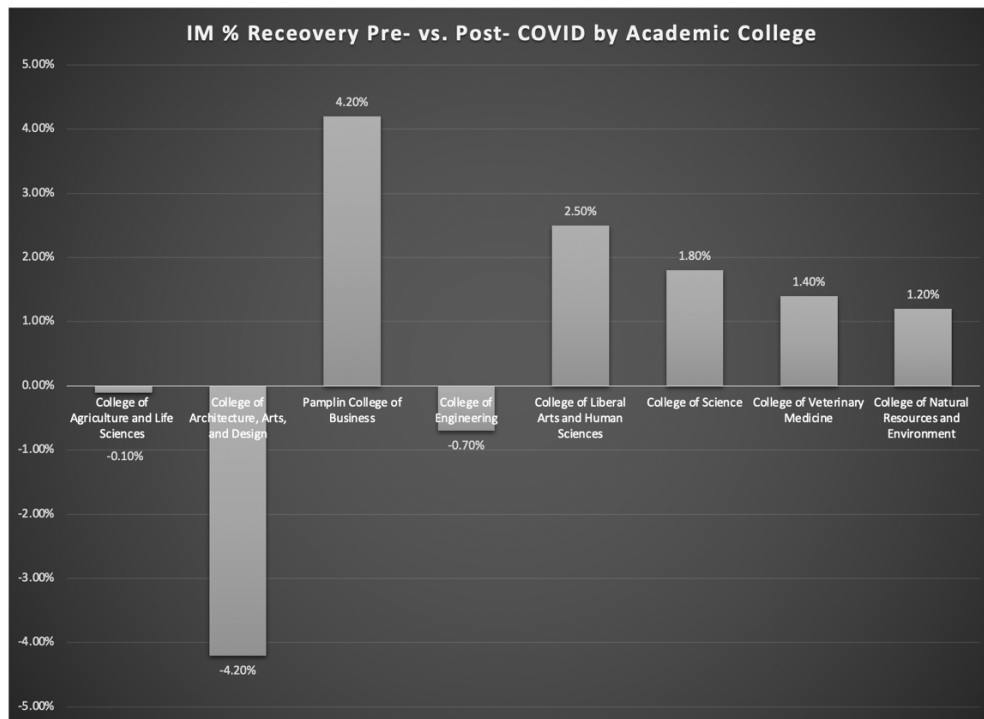


Figure 15. Difference in percent of students from each academic college who participated in intramurals in T1 versus T3, or overall recovery following the pandemic.

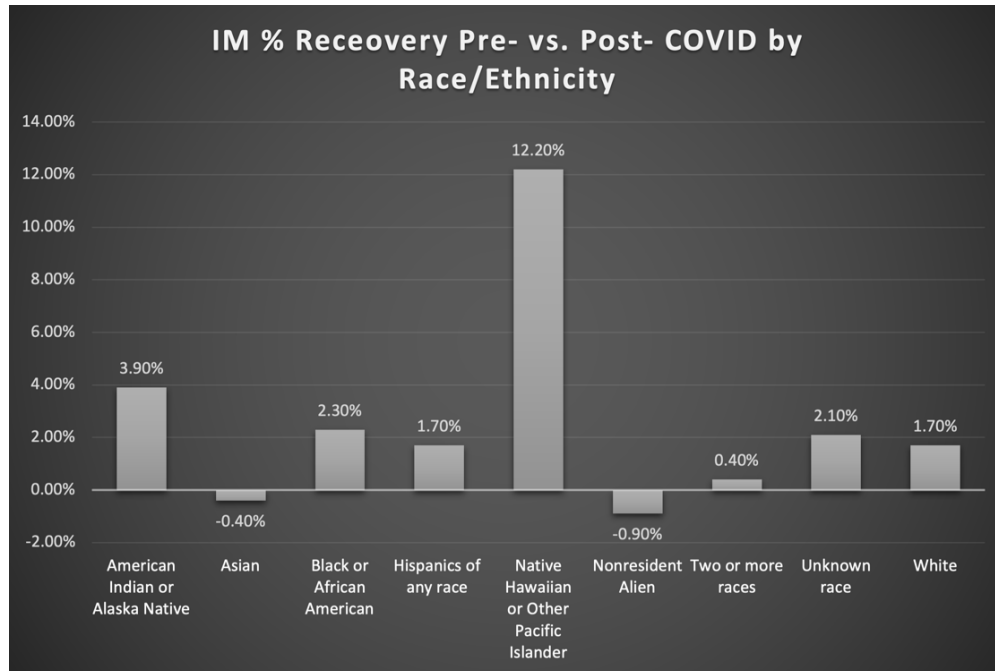


Figure 16. Difference in percent of students who participated in intramurals in T1 versus T3, or overall recovery, broken down by race/ethnicity.

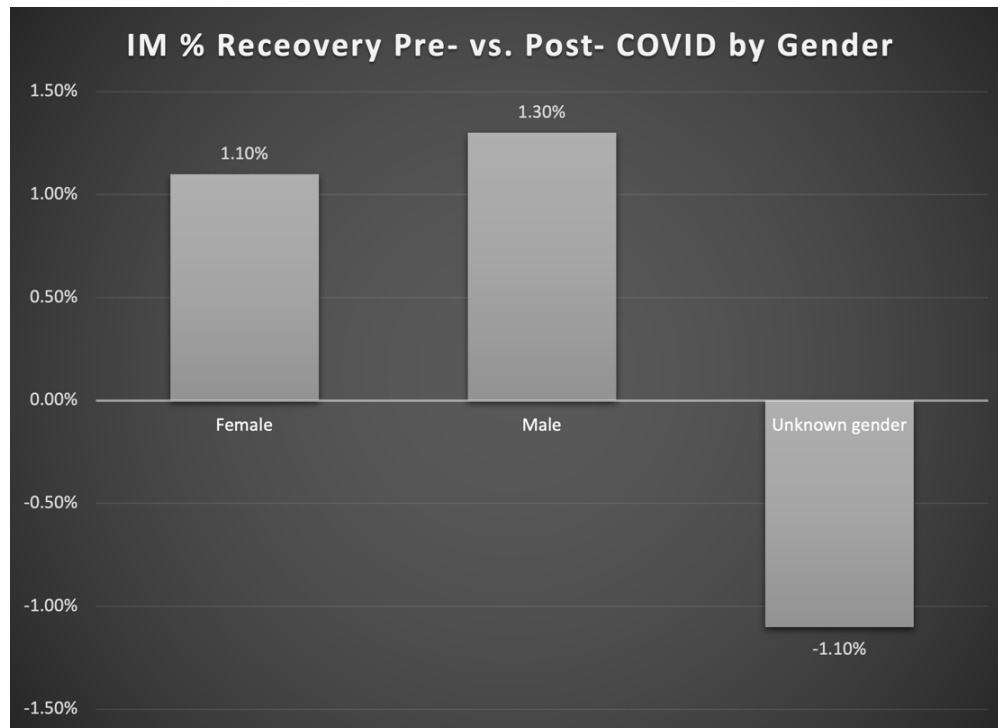


Figure 17. Difference in percent of students who participated in intramurals in T1 vs. T3, or overall recovery, broken down by gender.

DISCUSSION

The purpose of the project was to examine student participation in campus recreation at Virginia Tech before, during, and after the COVID-19 pandemic. The project aimed to identify and analyze differences in student participation within campus recreational facilities and programming during these distinct periods. Specifically, group exercise and intramural sports participation numbers were compared to gym swipes into any facility during each of these time periods. By gaining insight into how the pandemic influenced patterns of engagement and participation numbers, this project aimed to provide valuable information for the enhancement and adaptation of campus recreation offerings. The ultimate goal of this project was to contribute to the optimization of campus recreation experiences, ensuring that they align with the evolving needs of Virginia Tech students. By understanding the impact of the COVID-19 pandemic on campus recreation, this project aims to inform future planning and decision-making processes within Virginia Tech Rec Sports.

Recreational Sports Facility Gym Swipes

Looking at the unique student gym swipe numbers alone, it appears that Rec Sports facility usage has almost returned to where it was pre-COVID. However, as the university grows and the student population changes year to year, it is important to consider what percent of the student population these numbers represent. Since the goal of Rec Sports is to serve as much of the student population as possible (A. Cross, personal communication, March 2023), the percent of students using Rec Sports programs is the most important number to focus on and is the primary descriptive statistic used throughout this study.

There were a few consistent themes among all students, most academic colleges, all races/ethnicities, and all genders for gym swipes. Besides the Pamplin College of Business, a

decrease in percent of students was seen from T1 to T2 and an increase in percent of students was seen from T2 to T3 for all categories. The Pamplin College of Business for these two comparisons (T1 to T2 and T2 to T3) did not follow the logical trend that all other categories did, however (figures 3 and 4). This could be due to the fact that fewer students were enrolled in the Blacksburg campus for the Pamplin College of Business during T2, but more students from this college were enrolled as virtual students who could still live in the area and use Rec Sports facilities. Enrollment data in the UDC revealed that there were 4,683 Pamplin College of Business students enrolled in the Blacksburg campus and only 8 enrolled virtually during T1, whereas Blacksburg enrollment dropped to 2,501 and virtual enrollment increased to 2,771 during T2. This is just one explanation that could explain findings of this study. The results for the difference in percent of students from T1 versus T3 was consistent for all categories, including the Pamplin College of Business, but excluding the Unknown race/ethnicity category (figures 5, 8, and 11). The difference in percent of students T1 to T3 for gym swipes into any Rec Sports facility was negative for all categories, besides Unknown race/ethnicity. Therefore, based on percent of students, it seems that Rec Sports usage in terms of gym swipes into facilities has not recovered from the impact of COVID yet. The Unknown race/ethnicity category was the only category that had a higher percentage in T3 than T1. Since this category includes students whose race/ethnicity is in fact not known, it is hard to draw any conclusions about this.

The decrease in percent of students from the College of Agriculture and Life Sciences; College of Architecture, Arts, and Design; and College of Liberal Arts and Human Sciences from T1 to T2 were all similarly decreased (+/- 1.5%), which was approximately -19.5% (figures 2 and 3). The College of Engineering, College of Science, College of Veterinary Medicine, and College of Natural Resources and Environment appeared to have larger decreases in percent of

students with the College of Natural Resources and Environment having the largest decrease of -30.4% (figure 3). These colleges with seemingly larger decreases T1 to T2 also appeared to have larger increases T2 to T3, whereas the first three colleges mentioned experienced an increase comparable to the “all students” category again (figure 4). However, the change in percent of students from T2 to T3 is not a good indicator of overall recovery from the impact of the pandemic. A better indicator of this is the difference in percent from T1 compared to T3. The difference between these two time periods was -7.6% for all students (figure 2), showing that the percent of students post-COVID is still 7.6% lower than where it was pre-COVID. As seen in figure 5, none of the academic colleges have seen full recovery, but the colleges that appear to have the smallest difference between T1 and T3 percentages, and therefore the most recovery, were the College of Veterinary Medicine (-5.5%) and the College of Agriculture of Life Science (-6.0%). The College of Natural Resources and Environment appears to have seen the least recovery with the largest difference between T1 and T3 (-11.6%). All other colleges fall between -7.6% and -10.4%.

When gym swipe data was broken down by race/ethnicity, the percent change for gym swipes from T1 to T2 for most identities were between -9.1% and -19.3% (figure 6). The outliers, with seemingly much larger decreases in utilization based on gym swipes, were students who identified as American Indian or Alaska Native (-31.5%) or identified as Nonresident Alien (-36.6%). These two races/ethnicities also seemed to have larger increases in the percent of students from T2 to T3 (18.6% and 23.1% respectively), but again this does not indicate that these two identities have seen the most recovery overall (figure 6). The difference between T1 and T3 utilization by gym swipes for students who identify as American Indian or Alaska Native was only -8.4%. However, the Nonresident Alien identity appears to be the least recovered of all

the race/ethnicity identities T1 compared T3, with a -18.0% difference. Theoretically, this could have to do with international students feeling marginalized as a result of the pandemic, although Virginia Tech Rec Sports works to make all students feel included. However, international students do face discrimination that students from the United States do not, and Maleku et al. (2022) suggest that this has only increased as a result of the pandemic. The race/ethnicity category that appeared to have the most recovery T1 compared to T3 based on percent of students who swiped into a Rec Sports facility was the Unknown race category, which had a 1.3% increase in percent post-COVID. This was the only category of all breakdowns that had a positive difference between the two time periods, but again, it does not provide much direction since the true races/ethnicities of the students are in fact not known. For race/ethnicity, the other identities that appeared to have the most recovery were Black or African American, Hispanics of any race, Native Hawaiian or Other Pacific Islanders, and Two or more races. However, the differences for these identities were all still negative (figure 8).

Next, gym swipes data was broken down by gender. The change in percent of female students who swiped into a Rec Sports facility T1 to T2 was -21.6% compared to a -17.9% change for male students (figure 9). The percent of female students seemed to increase slightly more than the percent of male students from T2 to T3 with change of 12.4% for female students and 11.5% for male students (figure 10). The difference in percent of students in T1 compared to T3 is our best indicator of true utilization recovery once again, though. The difference for female students was -9.2% compared to a -6.4% difference for male students (figure 11), so this indicates that neither gender identity has fully recovered to where it was pre-COVID. However, since the male student percentage is closer to 0, it can be said that the male category is closer to recovery than female. The third category for gender is Unknown gender. This category actually

appeared to have the largest decrease in percent of students T1 to T2, the largest increase T2 to T3, and the best recovery when comparing T1 and T3 with a -2.3% difference (figures 9, 10, and 11). However, similar to the Unknown race/ethnicity category, it is hard to make sense of what this means since the true identities of these students are unknown.

There are other factors to consider as potential reasons why the percent of students swiping into Rec Sports facilities has not returned to the pre-COVID percentages besides the pandemic itself. For one, the facilities that were open and accessible to students changed more than once from 2018 to 2023 due to the War Memorial Hall renovation project. When War Memorial Hall was open, it was the most centrally located Rec Sports facility on campus, potentially making it easier for some students to get there. This facility was only open during T1 in this study (2018-2019), so lower percentages during T2 (2020-2021) and T3 (2022-2023) could be partially caused by this. To offset the space that Rec Sports lost during the War Memorial Hall renovations however, additional facilities were opened. The Field House was opened in the summer of 2020 as a temporary solution, and Venture Out was opened in January of 2021 as a permanent new offering for students. Since these new facilities were open, the percent of students swiping into any facility during T2 and T3 theoretically could have been just as high as the T1 percentage, but that was not the case for most categories. This could be because students did not know about the new facilities or because they viewed them as less convenient than War Memorial Hall and chose not to use them.

Group Exercise

In-person group exercise program offerings were very limited during T2 (2020-2021). Therefore, the percent change from T1 to T2 and the percent change from T2 to T3 were not considered for group exercise. The primary data that was collected group exercise was the

differences in percentages for T1 and T3, or overall recovery. The available data for group exercise did not go as far back as gym swipes, so the 2019-2020 academic year had to be used as T1 for group exercise. The 2019-2020 academic year was normal up until March of the 2020 spring semester (A. Cross, personal communication, April 2024), so we believe the results in this section are still viable since we do not observe many new students attending group exercise classes after spring break. The 2022-2023 academic year was used as T3 for group exercise just like gym swipes.

Unique student check-ins were used to capture the percent of the student body that utilized group exercise programming at least once in each time period. The difference in the percent of all students from T1 and T3 was -2.7%. This change shows that the percent of students engaging with group exercise through Rec Sports has not recovered back to where it was prior to the pandemic. However, the recovery for group exercise is better than the recovery for all gym swipes (-7.6%, figure 2). Group exercise data was also broken down by academic college, race/ethnicity, and gender to see if the percent utilization for any particular groups of students have seen more or less recovery (figures 12, 13, and 14 respectively).

All of the academic colleges had a negative difference in percent of students in T1 versus T3, showing that the percent of students using group exercise offerings through Rec Sports has not recovered across the board in this category (figure 12). The College of Agriculture and Life Sciences appears to be the least recovered with a -6.1% difference between T1 and T3 percent utilization. The College of Architecture, Arts, and Design appears to be the most recovered with a -1.3% difference between the two time periods. However, since the number is still negative, full recovery has not occurred in either college. The rest of the colleges' percent differences between T1 and T3 fall between -1.9% and -4.1% (figure 12).

The difference in percent of student utilization T1 versus T3 for group exercise broken down by race/ethnicity followed almost the same pattern as the academic colleges, with one exception. All races/ethnicities, excluding American Indian or Alaska Native, had negative differences in percentage (figure 13). This shows that, like academic colleges, a lack of recovery was seen across the board for the race/ethnicity category breakdown. The one exception was the American Indian or Alaska Native identity, which had a +0.6% difference. While the difference in percentage is positive, a deeper dive into the data revealed that the same number of students with this identity used group exercise in T1 and T2 , which was two in both time periods. The apparent increase in percentage here is likely due to a change in the total number of American Indian or Alaska Native students enrolled in the university.

The difference in percent between T1 and T3 for group exercise was negative across the board for the gender category breakdown, as well (figure 14). The percent of females who attended group exercise in T3 versus T1 had the largest difference of -5.9% compared to only a -0.3% difference for males and a -0.1% difference for those with an unknown gender. While the percent of female students is the furthest away from pre-COVID percent utilization, it is worth noting that group exercise still serves a much higher percentage of females compared to males in general. This is evident in the fact that less than 2% of male students used group exercise in both T1 and T3 (table 8), which is nowhere near the percentages seen for female students in both time periods. One must consider, it is much easier for a small percentage, like the 1.9% of male students who attended group exercise in T1, to recover than a larger one like the 23.8% of female students.

The increase of online group exercise offerings by both Rec Sports and other individuals/organizations is something worth considering when trying to understand recovery.

Virginia Tech Rec Sports began offering the option to attend group exercise classes virtually via Zoom during the pandemic and has continued to offer this option even now as capacity restrictions and other COVID-related policies have been lifted. All the classes offered on Zoom are also recorded and available to view later on the Rec Sports website. The number of students who attend group exercise via Zoom or watch the recorded classes later is not something that is tracked currently. However, observations from fitness instructors who can view how many participants they have on Zoom in each class indicate that people rarely logon to Zoom anymore post-COVID (Z. Worrell, personal communication, August 2022). If barely any students are using the online group fitness offerings from Rec Sports, this does not explain why the percent of students attending in-person group exercise T3 is lower than the percent in T1. However, it is possible that students are engaging with online group exercise and fitness elsewhere. According to Xiao & YongKang (2022), the online fitness industry grew over 77% globally from 2019 to 2021.

Intramurals

Intramurals were the last set of data to be collected, and the same time periods and comparisons as group exercise were used because again the available data was limited. Unlike gym swipes into facilities and group exercise class participation, intramural sports are the one area that appears to have consistent recovery back to and beyond pre-COVID/T1 (2019-2020) in many categories. The percent of students was used to evaluate this, just like gym swipes and group exercise, and this number is based on unique student participation in each academic year. The difference in percent between T1 (2019-2020) and T3 (2022-2023) was used to gauge overall recovery, where a negative number indicates that recovery has not occurred.

Again, intramurals are the one area where more positive differences were seen, indicating that recovery has occurred for some populations. First, looking at all students, the difference in percent is 1.2% higher in T3. When broken down by academic college, five of the seven colleges included had a positive difference as well, with the percent of students from the Pamplin College of Business 4.2% greater in T3 (figure 15). The College of Agriculture and Life Sciences and the College of Engineering did have negative differences, but the difference was $\leq -0.7\%$ for both which is still better than any recovery seen for group exercise or gym swipes. The College of Architecture, Arts, and Design is the one academic college that has a larger negative difference between T1 and T3 percent usage with -4.2% (figure 15). However, this is just the difference between the time periods included in this study which were 2019-2020 and 2022-2023 (table 9), and during data collection, it was noted that 18.0% of students from the College of Architecture, Arts, and Design participated in intramurals in 2021-2022, not one of the time periods analyzed in this study. If the 2021-2022 academic year was used as the T3 time period for this study, there would only be a -0.1% difference for the College of Architecture, Arts, and Design. This raises a question of why the percent of students from this college who participated in intramurals might be lower in 2022-2023 when fewer restrictions were in place.

Many positive differences between T1 and T3 percentages of students for intramurals were also seen when broken down by race/ethnicity. Seven of the nine races/ethnicities included in this study had a positive difference (figure 16) meaning the percent of students from that identity using intramurals is actually higher than where it was pre-COVID. The percent of Native Hawaiian or Other Pacific Islander students appeared to have the largest increase post-COVID with a $+12.2\%$ difference between T1 and T3. It is worth noting though, that while this would be a large increase for a race/ethnicity with a lot of these students enrolled in the university, the

12.2% increase for the Native Hawaiian or Other Pacific Islander identity is only an increase from 7 unique students in T1 to 11 unique students in T3. In comparison, the percent of students who identify as Hispanic of any race had an increase of 1.7% (figure 16), but this smaller percent increase is reflective of a unique student increase from 453 to 703. The two remaining races/ethnicities, which are Asian and Nonresident Alien, had negative differences, but they were both $\leq -0.9\%$ (figure 16). The -0.4% difference for the Asian identity does not raise too much concern because it is a very small difference, and it is a better recovery for this population of students than the recovery seen for group exercise or gym swipes. Additionally, the unique student count for Asian students is actually higher in T3 (729 vs. 595 in T1) despite a negative percent difference, so the decreased percentage could be due to a larger population of these students attending Virginia Tech. Nonresident Alien was the other race/ethnicity category that had a negative difference of -0.9% (figure 16). The unique student count for this population was not higher in T3, so the lack of recovery here is consistent with the lack of recovery for this population in group exercise and gym swipes.

The final breakdown for intramurals (IMs) was by gender. The differences in percent of both male and female students who participated in intramurals was positive (figure 17) when T3 was compared to T1. The percent of females who participated in IMs in T3 was 1.1% higher than T1, and the percent of males who participated in IMs in T3 was 1.3% higher. This shows that a higher percent of students who identify with these genders are engaging with intramural programming following the pandemic, and the increase is relatively equal for both genders. The difference in percent of students with an unknown gender was -1.1% (figure 17), but this does not necessarily indicate a lack a recovery. It is hard to draw any conclusions from an unknown

category anyway, but the negative difference is also only representing one less unique student in T3 (10 students in T1 vs. 9 students in T3).

Strengths and Limitations

This study was able to capture the percent of all Virginia Tech students, enrolled in the Blacksburg campus at the undergraduate and graduate level, who engaged with Rec Sports by swiping into a facility, taking a group exercise class, or participating in an intramural sport. The UDC's ability to break down all students by academic college, race/ethnicity, and gender provided valuable insight that otherwise would have not been possible. The descriptive statistics that were created from this study reveal that not all areas of Rec Sports have recovered the same following the pandemic and that recovery is different between academic colleges, races/ethnicities, and genders.

While the results of this study provide insight into the relationship between campus recreation usage at Virginia Tech and the COVID-19 pandemic, it is merely a starting point for understanding this topic fully due to several limitations. First, only one full academic year was used to define each time period (T1, T2, and T3). This was done intentionally in an attempt to keep the amount of data consistent between time periods and make for easy comparisons. This method was also chosen because the data in the UDC could not be broken down by individual semester or combined into more than one academic year. This presented an unexpected limitation specifically with group exercise and intramurals methods because the earliest available data for these two areas was the 2019-2020 academic year. It was not ideal to use the 2019-2020 academic year as T1 for group exercise and intramurals because it includes the Spring 2020 semester that was cut short due the start of the pandemic. However, this was the only option after searching archives for earlier data to be uploaded to the UDC and being unsuccessful.

There are also many other contextual factors to consider besides the COVID-19 pandemic when analyzing campus recreation participation data. The same Virginia Tech Recreational Sports facilities were not open throughout all three time periods in this study. The closure of War Memorial caused McComas Hall to become much more crowded, which could have possibly caused students to look for a gym elsewhere. Opening of the Field House was one attempt to offset the space lost with the closing of War Memorial, but it is possible that students do not know about it or do not view it as a convenient option being on the edge of campus (Z. Worrell, personal communication, March 2024). This study also only analyzed in-person Virginia Tech Rec Sports participation data. It did not capture whether students were working out at a different gym off campus or in their homes. It is possible that students' preferences and mindsets have changed as a result of the pandemic, but again this was not explored in this study.

Future Research

Further research and continued analysis of participation trends is necessary in ensuring campus recreation leaders have the most up-to-date and relevant information on which to base decisions and that students continue to have the best experience possible. Future researchers should consider exploring the topic using a mixed methods approach to include more types of qualitative data as well as quantitative data that can be tested for statistical significance. Analyzing unique student data only allowed this study to include basic descriptive statistics. Future research should consider running more in-depth statistics on total participation data that includes an analysis of recurring participants. While this study was able to show what percent of students interacted with Rec Sports at least one time, it would also be valuable to understand how many students return more than once. It could also be worthwhile to conduct interviews with, or administer surveys to, students who were enrolled at Virginia Tech during all three time periods

(T1, T2, and T3). This could provide additional qualitative data to supplement and potentially explain some of the results in this study. The data could also be broken down to consider other factors like undergraduate vs. graduate standing and housing on or off campus. Additionally, expanding the scope to include other universities could be beneficial in understanding if the trends at Virginia Tech are unique or if other schools have experienced different struggles and successes.

Dissemination

Dissemination of the findings in this study and future studies can be achieved by sharing the results with campus recreation professionals at other colleges and universities. The National Intramural-Recreational Sports Association (NIRSA) is known for supporting leaders in collegiate recreation and could therefore be a helpful resource. Not only does NIRSA offer several ways for campus recreation leaders to connect online, but they also host several in-person events throughout the year where information is shared via presentations, workshops, and roundtables.

Conclusion

As the world changes, campus recreation programs must adapt to meet the needs of students. The findings of this study shed light on the ability of Virginia Tech Rec Sports to adjust operations amidst crisis and continue offering students a way to stay active no matter the circumstances. While the data indicates some level of recovery in certain areas of Rec Sports post-COVID, full restoration to pre-COVID levels has not been achieved across all categories quite yet.

The gym swipe data included in this study shows that while the number of unique student gym swipes appears to be close to pre-pandemic levels, the percentage of student population

utilizing Rec Sports facilities is still lower. This emphasizes the need to consider the proportion of students the unique student data represents, rather than raw numbers alone. The results in group exercise participation are similar to gym swipes in that total recovery has not occurred. While some populations, like American Indian or Alaska Native students, seem to have improved their percent participation post-COVID, a deeper dive into the data shows that this may be due to shifts in the overall student population rather than genuine increases in engagement. Intramural sports are the one area of Rec Sports that has had a relatively successful recovery following the pandemic, with many categories showing positive differences in post-COVID percent participation compared to pre-COVID participation. The findings of this study suggest that intramural sports have not only recovered but, in some cases, have also even surpassed pre-COVID levels.

These findings provide valuable insight for professionals working in campus recreation, including the Director of Virginia Tech Rec Sports, Ali Cross. Understanding the trends in student participation will help decision-makers adapt to enhance offerings to better serve Virginia Tech students post-COVID.

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