Dotson A & Bunn JA. Comparisons in work and wellness in pre- versus during-COVID seasons. J Sport Human Perf 2022; 10(1):46-55

DOI: https://doi.org/10.12922/jshp.v.10i1.186

JOURNAL OF SPORT AND HUMAN PERFORMANCE

ORIGINAL RESEARCH OPEN ACCESS

COMPARISONS IN WORK AND WELLNESS IN PRE-VERSUS DURING-COVID LACROSSE SEASONS

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ABSTRACT

The COVID-19 pandemic disrupted typical training schedules and resources for university athletes. Research depicted larger levels of mental distress with the lack of normal coping mechanisms provided by exercise (Bullard, 2020). The COVID-19 pandemic caused athletes to adapt their training schedules for an unknown period. With the change in social and technical support, off-season training and regular season competitions risked unforeseen changes to fitness and wellbeing. This study assessed pre-COVID (PC) and during-COVID (DC) training volume and wellness, including stress and sleep. We hypothesized training volume and wellness scores would be lower DC than PC. Data collection of 19 Division I female lacrosse athletes took place with microtechnology and self-report forms. A repeated measures analysis of variance was utilized to compare data across years on a week-by-week basis. Significant findings were detected in wellness ($p = .034$) and stress ($p < .001$) showing higher scores PC than DC, but not in sleep scores ($p = .112$). Muscle soreness and energy scores were higher during PC training indicated feeling better physically PC than DC. Findings suggest the COVID-19 transition did not affect sleep as hypothesized but did affect wellness and training output scores, decreasing in both at PC to DC.

Keywords: athlete monitoring, team sport, mental health, pandemic

INTRODUCTION

In March of 2020 the COVID-19 pandemic spread rapidly resulting in large scale disruption worldwide. Many countries issued stay at home orders (SAHO) advising against large scale gatherings. SAHO closed many gyms and fitness centers following the risk of airborne contamination. There was additional caution placed on athletes as intense exercise can result in lower immune protection in the upper airways due to less salivary secretion increasing the risk of contracting COVID-19 (1). Following research and medical suggestion, many organizations closed or halted practices to protect athletes. As a precaution on March 12, 2020, the National Collegiate Athletics Association (NCAA) cancelled all division championships for both winter and spring sports. While a protective measure, disruption of routine can lead to mental distress and lack of typical coping mechanisms such as physical exercise and mindfulness activities, which includes an individuals' ability to act moment-to-moment (2). Athletes were left to adapt to an ominous situation with limited resources.

Typical workload for student-athletes while in-season includes participating in training and games six days per week for a maximum of twenty hours per week. During the off-season, student-athletes typically train five days per week for a total of eight hours per week. Student athletes indicated concern with maintaining fitness and enhancing technique without regularly structured campus routines, additionally women had greater levels of concerns about maintaining physical fitness and mental health while socially isolated (3). Following national shutdowns over three-fourths of athletes in secondary education reported training less than eight hours a week following SAHO (4). University student athletes required to return home faced similar challenges in training maintenance. University student- athletes required to return home faced similar challenges in training maintenance. The American Psychological Association stated college students might experience increased stress, anxiety, uncertainty, and sadness due to COVID-19 changing their normal routine with virtual classes, moving back home, missing friends, job loss, and family responsibilities. The ability for athletes to return to high performance play was a concern. Findings show a reduction in the number of training sessions per week during lockdown as athletes attempted to train individually (5). Following eight weeks of restricted training, university equestrian teams noted a decrease in performance for up to six weeks of resumed competition (6). The difference in off-season preparation during this SAHO period created changes in physical outputs of some athletes during the competition season. In addition, holistic well-being became a concern while student athletes adjusted to isolation and routine changes. Research shows college students reported worse mental health due to increased anxiety, loneliness, isolation, and distress resulting in universities cultivating new support systems for students (7).

Higher amounts of anxiety or stress can impede sleep and life quality thus COVID-19's impact on psychological and emotional health must also be considered as it impacts holistic health (8). Greater levels of anxiety and stress can occur during times of uncertainty, as seen with COVID-19 (9). Athletes were left to create a new normal without a guide or the level of support they were accustomed to with an uncertain date for normal activity. The surge in COVID-19 cases required athletic departments and coaching staff to send students home with impeded ability to support their athletes mentally or physically to maintain or achieve optimal levels of output. Lacking athletic support, some student athletes appeared hindered physically and mentally by COVID-19 and SAHO. Initial SAHO reports showed suboptimal nutritional habits, sleep quality, and other mental health concerns such as heightened anxiety and decreased motivation (3). Training routine differences appeared to impact athletic dynamics and sleep routines during the start of COVID-19. Athletes reported greater periods of time in bed and asleep detailing later mid-sleep periods, higher social jetlag, and longer sleep latency during lockdown periods than prior to March 2020 (5). These elements of wellness are important for growth and development of any individual, including those competing at elite levels. The lack of consistency in these personal care elements could directly contribute to an athlete's readiness for the season.

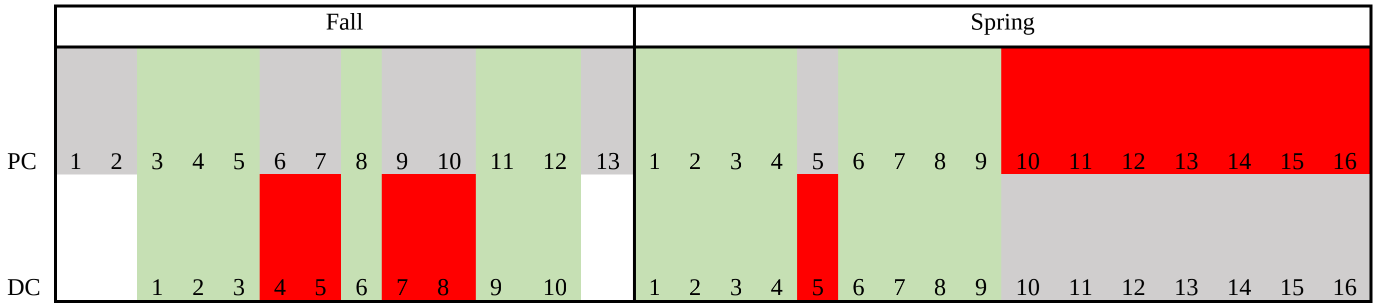
With the return to play in college athletics in fall of 2020, athletes were asked to return to training despite being separated from structured training for approximately five months. Further, the severity of COVID-19 during an intercollegiate season was still unknown. The NCAA provided Developing Standards for Practice and Competition as athletes and coaches aimed to return to play amid the pandemic in the fall of 2020 (10). Procedures from these standards included: testing within 72 hours of competition in high contact risk sports, daily self-health checks, physical distancing and masking practices to be implemented where feasible, universal masking on all sidelines, and quarantines of 14 days with high-risk exposure to COVID-19. These guidelines were updated in September of 2020 with instructions for gating criteria, avoiding large gatherings, reducing opportunities for student-athletes to congregate in weight rooms, and minimizing non-essential travel (11). These factors all have the potential to impact an athlete's mental and physical well-being as they return to the demands of a student-athlete. The purpose of this study was to assess differences in training volume and wellness between pre-COVID (PC) lacrosse training year and during-COVID (DC) training year. We hypothesized that training volume would be less DC compared to PC and that wellness scores would be lower DC compared to PC.

METHODS

Study Design and Timeline

Athletes provided written consent as part of a larger scope study in which these data were collected. The present analyses are a retrospective observational study design. The PC training year included their pre-season of fall 2019 and the shortened competitive season of spring 2020, ending after only nine weeks of observation. The DC training year included the off-season of fall 2020 and the competitive season of spring 2021. The number of training weeks within the 2019 and 2020 off seasons were different, thus they were aligned by date to create pairings for analyses. Figure 1 shows the number of weeks per training season and how they were aligned. The DC training season started two weeks later and ended one week earlier than PC. Additionally, the team also experienced two, two-week quarantine periods in fall DC and one, one-week quarantine period in spring DC. The dependent variables analyzed in this study included global positioning system (GPS)-based metrics [total distance, high-intensity distance (HID), sprints, accelerations, and decelerations] and wellness metrics (total wellness, muscle soreness, sleep quality, energy, and stress). This study was approved by the institutional review board and conducted in alignment with the Declaration of Helsinki.

Figure 1. Schematic of the weeks assessed during the two years of this study. Weeks shaded green were included in analyses. Weeks shaded in red were not analyzed due to COVID-19 preventing team practice. Weeks shown in gray were not analyzed because there was no matching data between the two years.



Participants

Division I female lacrosse athletes (n = 30) provided informed consent for study participation where training and wellness data were captured. Athletes were included in the present analyses if they were on the team during both training years analyzed (10 athletes were excluded). Athletes were excluded from analyses if they sustained an injury that kept them from training and competing for two or more weeks (1 athlete excluded). Analyses included a final n-size of 19 athletes.

Measurements

VX Sport (Wellington, New Zealand) microtechnology was used to capture objective data from training and competitions. These data were measured at 10 Hz with a GPS unit for each athlete. Athletes wore the same unit each day and all units were connected to satellites prior to the start of practice or competition warm-up. Data were downloaded from the units into the VX Sport Training Tool software program where dead times were trimmed out of analyses. Data were then exported for analysis.

Wellness questionnaires were answered every morning upon awakening between 6 and 10 a.m. by the athletes. Questions were centered on muscle soreness, sleep quality, energy, and stress. The questions are as follows:

1. How are your muscles feeling today?
2. How did you sleep last night?
3. How are your energy levels feeling for your training today?
4. How stressed are you?

Each question had a choice of five answers with scores anchored at 0, 25, 50, 75, and 100, and higher scores indicated better well-being for each question. Wellness surveys were answered on a smartphone device via the VX Sport Cloud application.

The PC training season consisted of 13 weeks (mean 61.0 ± 0.2 days/athlete) of data collected and 9 weeks (mean 52.8 ± 0.5 days/athlete) of data collected in the PC competitive season. The DC training season included 6 weeks (mean 34.1 ± 2.7 days/athlete) of data collected and 8 weeks (mean 47.0 ± 2.8 days/athlete) of data collected in the DC competitive season. For analyses, only the first nine weeks of the DC competitive season was included. Weeks were aligned by date between PC and DC years for analysis. Weekly totals were calculated per athlete for each GPS-based metric and weekly mean wellness scores and sub-scores were calculated for each athlete.

Statistical Analysis

SPSS (version 25.0, IBM, Chicago, IL) was used for analysis. An alpha level of .05 determined significance. Normality of the GPS-based data with a Shapiro-Wilks test. Results indicated that the data were normally distributed; parametric methods were used for analysis. Differences for time for each metric for the fall and spring semesters was evaluated with a multivariate repeated measures analysis of variance (RM-MANOVA). Subsequent univariate analyses indicated if there was a difference for specific metrics. If the univariate analyses indicated a p-value less than 0.05 then paired t-tests were used to determine specific differences between PC and DC years.

Wellness and sub-scores were also evaluated for normality using a Shapiro-Wilks test. Muscle soreness and energy sub-scores were not normally distributed, but wellness, sleep, and stress were. An RM-MANOVA was used to evaluate main effect differences for time for each wellness, sleep, and stress for the fall and spring semesters. Univariate analyses indicated if there was a difference for specific metrics. If the univariate analyses indicated a p value less than 0.05 then paired t-tests were used to determine specific differences between PC and DC years. Wilcoxon's signed rank test was used to evaluate time differences for muscle soreness and energy. If the p value was less than 0.05, then a Friedman's test was used to compare specific weeks PC and DC.

Partial eta squared (η_p^2) effect sizes were calculated for parametric analyses and Kendall's W (χ^2/N(K-1)) effect sizes were calculated for non-parametric analyses. η_p^2 were interpreted as small (.01), moderate (.06), and large (.14). Interpretation for Kendall's W effect sizes were small (.3), moderate (.5), and large (.8) (12).

RESULTS

Table 1 shows the results of each of the RM-MANOVAs that were conducted. For the fall semesters (F), the main effect was significant (Table 1) and univariate analyses indicated a difference for distance ($p < .001$, $\eta_p^2 = .952$), HID ($p = .002$, $\eta_p^2 = .840$), sprints ($p = .003$, $\eta_p^2 = .694$), accelerations ($p < .001$, $\eta_p^2 = .900$), and decelerations ($p < .001$, $\eta_p^2 = .785$). All effect sizes are interpreted as large. Figure 2 shows the means and distribution of GPS-based data across the fall and spring semesters. The pairwise comparisons for distance indicated differences between PC and DC years for weeks F1 ($p < .001$), F2 ($p = .003$), and F9 ($p < .001$), and F10 ($p = .001$). PC distance was greater in weeks F1, F2, and F10. For HID, PC was greater than DC in week F1 ($p < .001$), and DC was greater than PC in week F6 ($p = .001$). Sprints were different between years at weeks F1 ($p < .001$), F2 ($p = .002$), F6 ($p = .020$), and F10 ($p = .013$). DC was greater than PC for each week, except week F1. Comparisons for accelerations indicated a difference during weeks F1 ($p < .001$), F2 ($p < .001$), and F9 ($p < .001$). In all three weeks, PC required more accelerations than DC. Decelerations were greater in PC than DC for weeks F1 ($p < .001$), F2 ($p < .001$), and F3 ($p = .005$).

For the spring semesters (S), the main effect was significant and univariate analyses showed differences in all five variables ($p < .001$) and effect sizes were all interpreted as large (distance $\eta_p^2 = .703$; HID $\eta_p^2 = .642$; sprint $\eta_p^2 = .456$; acceleration $\eta_p^2 = .573$; deceleration $\eta_p^2 = .473$). Pairwise comparisons for distance indicated differences in distance as weeks S1 ($p < .001$), S2 ($p = .002$), S3 ($p < .001$), S6 ($p = .004$), and S9 ($p < .001$). PC was greater than DC in weeks S1-3, but DC was greater than PC in weeks S6 and S9. HID was different across years for weeks S2 ($p = .041$), S3 ($p = .010$), S6 ($p < .001$), S7 ($p < .001$), S8 ($p < .001$), and S9 ($p < .001$). PC was greater than DC for weeks S2, S3, and S7. For sprints, DC was greater than PC in weeks S1 ($p < .001$), S5 ($p = .010$), S6 ($p = .004$), S8 ($p < .001$), and S9 ($p = .001$). Accelerations were different at weeks S1 ($p = .043$), S3 ($p = .007$), and S9 ($p < .001$). PC was greater than DC during weeks S1 and S3, but DC was greater at week S9. Decelerations were higher PC than DC in weeks S1-3 and S5 ($p = .003$-$.039$), but DC was higher than PC in week S9 ($p < .001$).

Figure 3 shows the wellness score and sub-scores across each week for PC and DC. For the F semester, the main effect was significant, and the univariate tests showed differences in wellness ($p = .006$, $\eta_p^2 = .149$), and stress ($p < .001$, $\eta_p^2 = .273$), but not for sleep ($p = .362$, $\eta_p^2 = .048$). All effect sizes for differences were interpreted as large. For the composite wellness score, PC was greater than DC in the fall semesters at weeks F1, F2, and F6 ($p = .001$-$.009$). Stress scores were higher during the PC year than the DC year for each week during the fall semester ($p = .000$ - $.050$). The Friedman's test for muscle soreness indicated a difference ($\chi^2(12) = 120.882$, $p < .001$, $W = 0.478$) and for energy ($\chi^2(11) = 59.106$, $p < .001$, $W = 0.234$). These effect sizes were moderate and small, respectively. The Wilcoxon signed-rank tests showed that muscle soreness scores were better PC than DC at weeks F1 and F6 ($p < .001$). The Wilcoxon signed-rank tests showed that energy was different between years for weeks F1, F3, and F9 ($p = .001$-$.008$). For weeks F1 and F9, DC scores were higher than PC scores, but this was the opposite in week F3.

The S semesters main effect was significant and univariate tests showed differences for wellness ($p = .034$, $\eta_p^2 = .123$) and stress ($p < .001$, $\eta_p^2 = .190$), but not sleep ($p = .112$, $\eta_p^2 = .072$). Effect sizes for statistical differences were interpreted as large. PC wellness scores were higher than DC scores for weeks S2 ($p = .031$) and S5 ($p = .024$). For stress, PC scores were higher than DC scores (indicating less stress PC) for weeks S2-3 and S8 ($p = .000$ - $.027$). The Friedman's tests indicated differences for muscle soreness ($\chi^2(15)= 87.820$, $p <.001$, $W = 0.244$) and energy ($\chi^2(15)= 47.118$, $p < .001$, $W = 0.131$). These effect sizes are both interpreted as small. Wilcoxon signed-rank tests showed differences in muscle soreness at weeks S1, S2, S5, S7, S9 ($p = .002$ - $.044$). Muscle soreness scores were higher (indicating feeling good) PC than DC during weeks S1 and S7, but DC scores were higher for weeks S2, S5, and S9. Energy scores were higher PC than DC for week S1 ($p = .008$).

Table 1. Results of the RM-MAOVA and calculated partial eta squared effect sizes (η_p^2).

Main effect	Lambda value	Degrees of freedom	Significance	η_p^2 (interpretation)
GPS metrics - Fall	11.160	55,189	< .001	0.738 (large)
GPS metrics - Spring	19.747	75,1135	< .001	0.551 (large)
Wellness – Fall	5.261	33,708	< .001	0.194 (large)
Wellness - Spring	3.171	45,1020	< .001	0.122

Figure 2. Mean and standard deviations across weeks of training for A) total distance, B) high-intensity distance, C) sprints, D) accelerations, and E) decelerations. * indicates a difference between pre-COVID (PC) and during COVID (DC) weeks, p < .05.

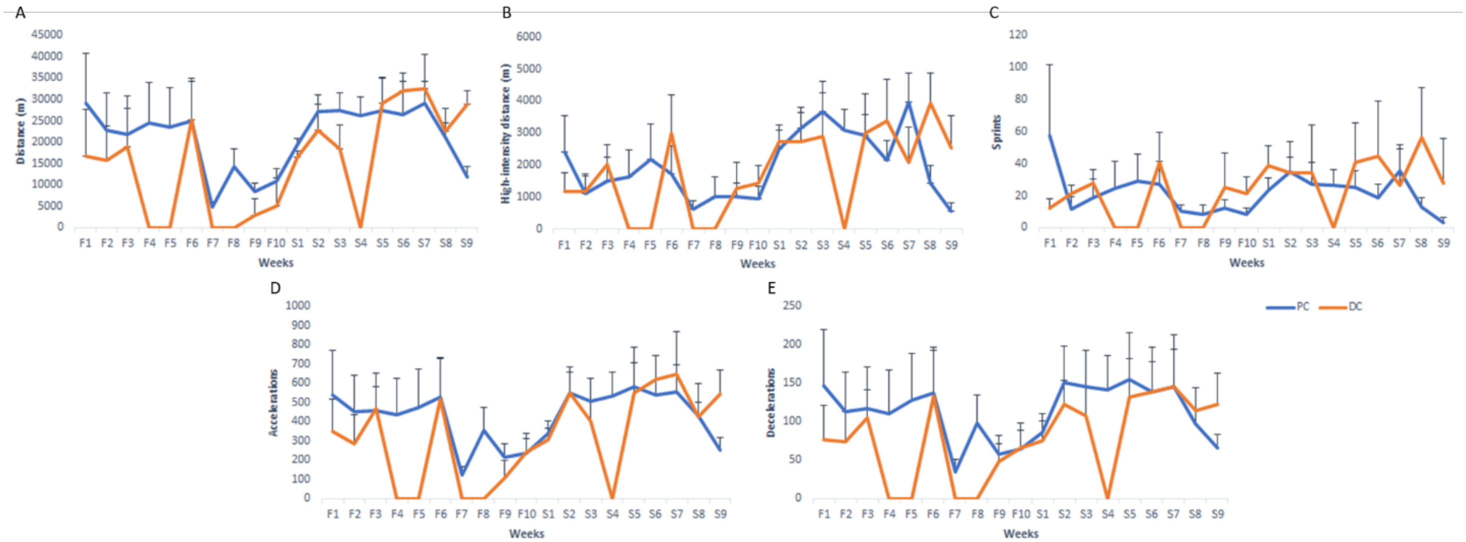
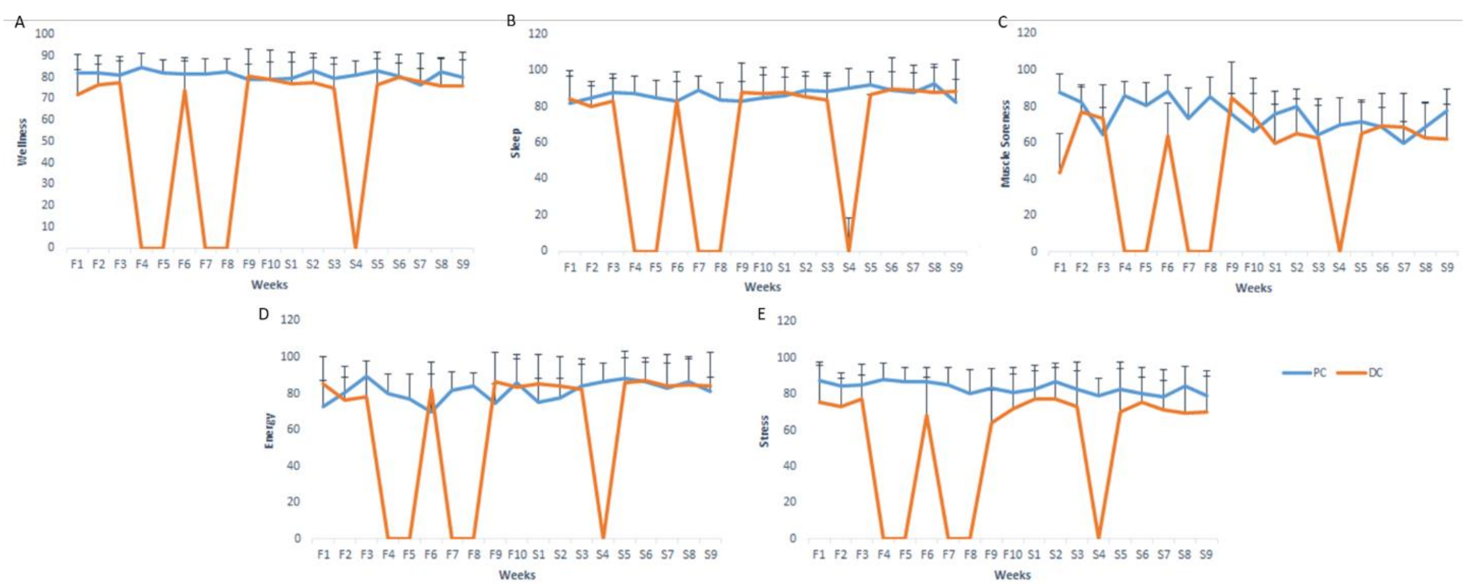


Figure 3. Mean and standard deviations across weeks of training for A) total wellness, B) sleep, C) muscle soreness, D) energy, and E) stress. * indicates a difference between pre-COVID (PC) and during COVID (DC) weeks, p < .05.



DISCUSSION

This research study investigated differences in wellness and workload of athletes prior to and during the beginning of the COVID-19 pandemic. Data from the 2019 and 2020 training seasons were compared weekly between years. Researchers initially hypothesized training volume and wellness scores would be lower DC than PC. Wellness and workload data did show significance differences with PC having a better training system holistically, but DC training periods did show improvements towards the end of the spring season.

When weekly scores were compared across years, PC semesters showed greater outputs in distance and decelerations in the early weeks of training. Deceleration scores showed clear differences in the spring semesters with more effort PC in the early training periods but greater effort by the end of the semester DC. This may be the result of better access to facilities in summer PC allowing for a better start at the beginning of training and improved schedules and adaptive access by the end of spring DC. Researchers found on average women had less access to sports medicine specialists and training facilities when compared to men DC SAHO and quarantine periods (8).

Training schedules were more consistent by spring DC. All workload metrics increased towards the end of spring DC to levels at or exceeding those of the PC year. Researchers have found athletes need to remain active and adapt training to maintain fitness and well-being when team and competition preparation is restricted (13). Even with periods of less development in the fall DC following both quarantines, physicality through the DC year ended better than PC. Training solo can be challenging and impact development during quarantine periods, especially for athletes with sport-specific training staying (4). During quarantines, the athletes did train on their own, but because this was unofficial training, data were not captured. This volunteer training may have allowed athletes to reach higher workloads during training than what we hypothesized. It is also possible this occurred due to COVID-19 having lower symptom severity in typically young, fit, healthy female athletes (6,14).

Research findings were also significant in wellness scores. Differences across weeks for PC and DC semesters were present in wellness and stress, but not in sleep scores. For the total wellness score, the initial weeks of training and mid-semester showed greater wellness PC than DC. Increased anxiety and stress disproportionately affected female student-athletes when it came to maintaining fitness and performance with the added stress of the pandemic these athletes had an added layer affecting wellness at the start of the DC training period (3). Stress scores were higher during the PC year than the DC year for each week during the fall semester suggesting less stress PC. For stress in the spring, PC scores denoted less stress than DC primarily at the beginning of the semester and one week towards the end of the semester. These findings coincide with previous literature indicated that decreases in training frequency during lockdowns or quarantines result in increased reports of depression/anxiety and stress (5). Scores also showed that energy was different between years for the beginning and end of the fall semester with DC being higher than PC. In the spring, energy scores were higher PC than DC for the initial training week. These data disagree with previous findings indicating that in the fall of 2020 many athletes experienced energy loss and a lack of training motivation due to increased stress, moving home, and limited resources (2,13). The athletes in the present study seemed to return to training with greater vigor than the previous year. Perhaps the SAHO allowed these athletes extra recovery time that restored their energy. Finally, this study showed differences in muscle soreness scores between the training years. Athletes reported feeling less muscle soreness PC than DC at the first week of fall training and mid-fall semester. In the spring, athletes had less muscle soreness towards the middle and end of their semester DC which could be the result of access and schedule consistency.

While sleep scores showed no differences, this may have been a result of an adaptation in emotional intelligence DC. Emotional intelligence enables individuals to cope with stressful events in positive ways. This can be seen in increases of self-awareness, self-regulation, motivation, social skills, and empathy. Sleep is a crucial factor in maintaining and building emotional intelligence as sleep allows individuals to process emotional events. For women emotional intelligence recovery is related to the quantity and quality of their sleep when helping their coping COVID-19 (15). Though emotional intelligence was not measured in the present study, we speculate that the participants increased emotional intelligence during resting periods due to the stress of COVID-19, academic load, and season changes. Though sleep was consistent between years, based on improvements in muscle soreness scores, energy, and overall wellness the consistency aided in physical and mental recovery. Coping measures DC were present, findings demonstrate reduced wellness in the fall and lower levels of stress was in spring when the training program was closer to 2019's regiment. Spring PC allowed for more consistency in training and better stability in wellness scores during the PC year.

There are limitations in this study. This includes only analyzing one team during this period as these findings may not be generalizable. This is emphasized by this team going through multiple quarantine periods due to COVID-19 spreading amongst members. This required changes in routine which could have impacted wellness and workload scores for those weeks. Another limitation is in the shortcomings of the wellness survey having no qualitative information to provide context for stress periods. We also did not capture any workload data when athletes chose to train voluntarily on their own during the quarantine periods. These data may have provided insight into the maintenance of training loads during these restricted weeks. Future researchers may seek to expand how longer quarantines impact wellness and workload. They may also consider qualitative analysis of wellness and adding different teams for cross-correlation.

CONCLUSION

As predicted our findings support better wellness for these female student athletes PC. Findings also indicated better wellness towards the end of DC training suggesting some adaptation in training or coping skills by this time. These improvements in the DC year were more notable in the spring semester. The findings were similar in overall workload showing better PC performance but improving to be greater DC by the spring semester. There is a likelihood this team put large amounts of effort into training as they had lost part of their fall regimen. Holistically we found better scores when the team had more consistency PC, and large improvements after getting through the DC season.

Acknowledgements

The authors would like to thank the coaches who allowed this study to happen and the athletes for their diligent participation.

REFERENCES

1. Scudiero O, Lombardo B, Brancaccio M, Mennitti C, Cesaro A, Fimiani F, Gentile L, Moscarella E, Amodio F, Ranieri A, Gragnano F. Exercise, immune system, nutrition, respiratory and cardiovascular diseases during COVID-19: a complex combination. *International Journal of Environmental Research and Public Health*. 2021;18(3):904.
2. Bullard JB. The impact of COVID-19 on the well-being of division III student-athletes. *The Sport Journal*. 2020;21:1-25.
3. Chandler AJ, Arent MA, Cintineo HP, Torres-McGehee TM, Winkelmann ZK, Arent SM. The impacts of COVID-19 on collegiate student-athlete training, health, and well-being. *Translational Journal of the American College of Sports Medicine*. 2021; 6(4):e000173.
4. Liu IQ. The impact of COVID-19 pandemic on high performance secondary school student-athletes. *The Sport Journal*. 2020; 24.
5. Facer-Childs ER, Hoffman D, Tran JN, Drummond SP, Rajaratnam SM. Sleep and mental health in athletes during COVID-19 lockdown. *Sleep*. 2021; 44(5):zsaa261.
6. Demarie S, Galvani C, Billat VL. Horse-riding competitions pre and post covid-19: Effect of anxiety, srpe and hr on performance in eventing. *International Journal of Environmental Research and Public Health*. 2020; 17(22):8648.
7. Zhai Y, Du X. Addressing collegiate mental health amid COVID-19 pandemic. *Psychiatry Research*. 2020; 1;288:113003.
8. Bruinvels G, Lewis NA, Blagrove RC, Scott D, Simpson RJ, Baggish AL, et al. COVID-19–Considerations for the Female Athlete. *Frontiers in Sports and Active Living*. 2021; 16;3:22.
9. Weinberg A, Cooper C. The nature of stress in turbulent times. In: *Stress in Turbulent Times*. Palgrave Macmillan, London; 2012; p. 39–61.
10. Resocialization of Collegiate Sport: Developing Standards for Practice and Competition - NCAA.org [Internet]. [cited 2022 Jul 12]. Available from: https://www.ncaa.org/sports/2020/7/14/resocialization-of-collegiate-sport-developing-standards-for-practice-and-competition.aspx
11. Core Principles of Resocialization of Collegiate Sport - NCAA.org [Internet]. [cited 2022 Jul 12]. Available from: https://www.ncaa.org/sports/2020/5/1/core-principles-of-resocialization-of-collegiate-sport.aspx
12. Cohen J. Statistical Power Analysis for the Behavioural Science (2nd Edition). Statistical Power Anaylsis for the Behavioral Sciences. 1988.
13. Fitzgerald HT, Rubin ST, Fitzgerald DA, Rubin BK. Covid-19 and the impact on young athletes. *Paediatric Respiratory Reviews*. 2021; 39:9–15.
14. Wu Z, McGoogan JM. Characteristics of and Important Lessons From the Coronavirus Disease 2019 (COVID-19) Outbreak in China: Summary of a Report of 72 314 Cases From the Chinese Center for Disease Control and Prevention. *JAMA* 2020; 323(13):1239–42.
15. Mon-López D, García-Aliaga A, Ginés Bartolomé A, Muriarte Solana D. How has COVID-19 modified training and mood in professional and non-professional football players? *Physiology & Behavior*. 2020; 227:113148.