

# Impact of COVID-19 on Recovered Athletes Returning to Competitive Play in the NBA “Bubble”

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**Background:** The global pandemic caused by COVID-19 has had far-reaching implications for the world of professional sports. The National Basketball Association (NBA) suspended active regular season play in 2020 after a player tested positive for SARS-CoV-2. No previous studies have examined the impact of COVID-19 on return to play in the NBA.

**Purpose/Hypothesis:** The purpose of this study was to examine performance measures for NBA players who had recovered from COVID-19 and returned to play in the NBA bubble. We hypothesized that these athletes would play fewer minutes and have decreased performance statistics compared with performance during the 2019-2020 regular season prior to the lockdown and with career averages.

**Study Design:** Case series; Level of evidence, 4.

**Methods:** NBA players positive for SARS-CoV-2 who played in both the 2019-2020 regular season and the NBA bubble were identified. Data collected included player demographics and player performance statistics.

**Results:** A total of 20 players were included in the study. Players who had recovered from COVID-19 played significantly fewer minutes per game in the NBA bubble (25.8 vs 28.7;  $P = .04$ ) and made fewer field goals per game (4.6 vs 5.4;  $P = .02$ ) compared with the season prior to shutdown. While NBA bubble players demonstrated slight decreases in averages for points ( $P = .06$ ), rebounds ( $P = .13$ ), assists ( $P = .23$ ), steals ( $P = .30$ ), and blocks ( $P = .71$ ) per game, these were not statistically significant. Aside from an increase in made free throws per game during the bubble (3.3 vs 2.8;  $P = .04$ ), player performance was not significantly different from career averages.

**Conclusion:** For players who tested positive for SARS-CoV-2 prior to playing in the NBA bubble, the current study demonstrated that despite playing significantly fewer minutes per game, performance was not statistically different from either their pre-COVID 2019-2020 level of play or from their career averages.

**Keywords:** COVID-19; SARS-CoV-2; basketball; NBA bubble

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The global COVID-19 pandemic caused by the novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has had far-reaching implications for the world of professional sports. The National Basketball Association (NBA) was among the first of the major American professional sports leagues to suspend active regular season play after a player tested positive for SARS-CoV-2.<sup>4</sup> On March 11, 2020, the NBA announced that regular season play would be postponed indefinitely. The scheduled regular season and playoffs, which normally culminate in the NBA Finals in early June, were canceled.

Even with the rapid stoppage of play in response to the pandemic, dozens of players were reported to have tested positive for SARS-CoV-2. Despite a positive test result, the degree of symptomatology among involved players was unknown. Players positive for SARS-CoV-2 were of varying ages with different risk factors and social environments,

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which may have affected their symptom severity and duration. For players completing their quarantine after COVID-19 recovery, little was known about how effective their play would be upon return to competition. Furthermore, the long-term implications of COVID-19 disease on professional athletes remain unknown.

After the shutdown, the NBA weighed various options for resuming the 2019-2020 season. Ending a delay of over 4 months, the NBA made the decision to restart play in a novel format called the NBA “bubble,” whereby invited teams would compete in an abbreviated regular season and playoff format in a single, isolated environment in Orlando, Florida.<sup>22</sup> The NBA also chose to limit the number of teams invited to play in the bubble. The total number of teams invited was 22: the top 8 teams from each conference plus 6 additional teams that were within 6 games of the number 8 seed in their conference.<sup>3,22</sup> Teams were limited to 37 personnel including players, coaches, and staff.<sup>7</sup> In total, approximately 350 NBA players participated in the bubble.<sup>9</sup> Guidelines were developed for the NBA bubble to limit exposure and transmission of the virus, most notably frequent testing for SARS-CoV-2 and strict travel restrictions.<sup>12,22</sup> Players were tested before travel to the bubble with both diagnostic nasal and oral swabs and antibody blood testing.<sup>2,20</sup> Once they arrived, players were isolated in their rooms until they had 2 negative polymerase chain reaction deep nasal test results. Subsequently, players were tested daily or every other day with nasal/oral swab testing.<sup>2,7,20</sup> Players and staff inside the bubble were prohibited from traveling outside the bubble without facing a quarantine.<sup>7</sup> Additionally, nonessential personnel outside of players, staff, and media (such as player families) were greatly restricted in the initial bubble guidelines.

The purpose of this study was to examine the impact of COVID-19 disease on recovered NBA players returning to competitive play in the NBA bubble by comparing player performance measures for pre- and post-NBA shutdown. We hypothesized that players who had recovered from COVID-19 would play fewer minutes in the NBA bubble and have decreased statistical performance as compared with the 2019-2020 regular season before the lockdown or compared with career averages.

## METHODS

NBA players who tested positive for SARS-CoV-2 between March 1, 2020, and August 20, 2020, were identified for inclusion in the study. Documentation of positive testing was obtained from publicly available websites including NBA team websites ([www.NBA.com](http://www.NBA.com)) and other sports news entities ([www.ESPN.com](http://www.ESPN.com), [www.cbssports.com](http://www.cbssports.com), [www.slamonline.com](http://www.slamonline.com), [www.twitter.com](http://www.twitter.com)). For all positive players, documentation of positive testing was verified on a minimum of 2 sources. This study utilized only publicly available data, qualifying it for exemption from institutional review board approval.

Inclusion criteria included NBA players that had a documented positive SARS-CoV-2 test who also played a minimum of 4 games in both (1) the 2019-2020 season before the

NBA shutdown on March 11, 2020 and (2) after the start of the NBA bubble on June 30, 2020. Exclusion criteria included players who (1) played for teams not invited to the NBA bubble, (2) were not on current team rosters at the time of the NBA bubble, (3) were on the injured reserve list for non-COVID-19 related reasons, (4) chose not to return to play (RTP) in the NBA bubble for personal reasons, (5) chose to keep their positive SARS-CoV-2 status anonymous, and (6) were still completing quarantine at the time of the NBA bubble.

For players who passed the inclusion and exclusion criteria, objective player data were obtained from various websites that collect NBA statistics (<https://www.rotowire.com/basketball/>, <https://www.basketball-reference.com>). Data obtained included demographic data (age, height, weight, seasons played in NBA, primary position) and individual player number of games played and per-game average statistical performance (minutes played, points, rebounds, assists, steals, blocks, turnovers, field goals [FG] made, FGs attempted, FG percentage, free throws [FT] made, FTs attempted, FT percentage, 3-point FGs made, 3-point FGs attempted, 3-point FG percentage, offensive rebounds, defensive rebounds, and fouls). The player efficiency rating metric was unable to be calculated for the NBA bubble competition and was thus excluded. Averages from regular season play only were assessed.

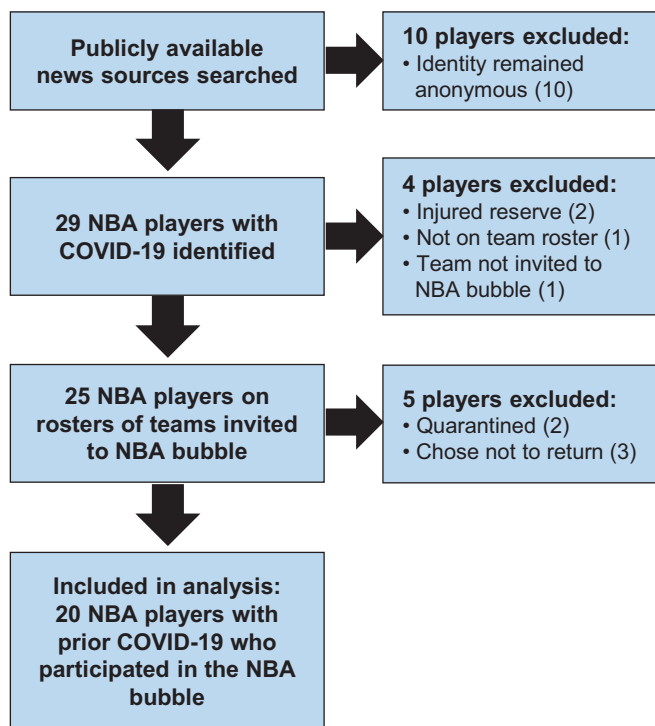
Statistical performance comparisons for study participants were performed for (1) averages from the 2019-2020 season pre-COVID-19 (from October 22, 2019, to March 11, 2020) versus averages from the 2019-2020 season in the NBA bubble (from July 30, 2020, to August 14, 2020) and (2) overall career averages versus averages from the 2019-2020 season in the NBA bubble. Comparisons were performed using paired Student *t* tests, with a 2-sided *P* value < .05 considered statistically significant. Data were analyzed using SPSS V 26 (IBM).

## RESULTS

A total of 29 players with COVID-19 were identified. An additional 10 players were reported by news outlets; however, these players chose to remain anonymous and thus were excluded from the study. Of the 29 identified players, 20 players met the inclusion criteria and were included in the study analysis (Figure 1). The average age for players who tested positive was 26.7 years, average weight was 221.9 pounds, and average height was 78.2 inches. Average career length at the time of COVID-19 diagnosis was 5.5 years (range, 1-12 years). Primary position breakdown was as follows: 20% point guard (*n* = 4); 30% shooting guard (*n* = 6); 15% small forward (*n* = 3); 10% power forward (*n* = 2); and 25% center (*n* = 5).

### Pre-COVID Regular Season Versus NBA Bubble

The first analysis for this study involved a matched comparison of objective statistical performance measures for the 2019-2020 regular season before the shutdown (Pre-COVID) against their performance in RTP in the NBA



**Figure 1.** Study flowchart showing included and excluded players. NBA, National Basketball Association.

bubble. These data are shown in Table 1. Players in the NBA bubble played significantly fewer minutes (25.8 vs 28.7;  $P = .04$ ) and made fewer FGs (4.6 vs 5.4;  $P = .02$ ) per game. While NBA bubble players demonstrated slight decreases in averages for points, rebounds, assists, steals, and blocks per game, these were nonsignificant.

### Career Averages Versus Bubble

The second analysis for this study involved a matched comparison of performance measures for overall career averages against player performance in the NBA bubble. These data are shown in Table 2. Players in the NBA bubble attempted significantly more FTs per game compared with their career average (3.3 vs 2.8;  $P = .04$ ). These players also had slight increases in points, rebounds, and assists, and decreases in minutes, steals, and FG percentage per game compared with their career averages; however, the changes were not significant.

### DISCUSSION

In this analysis of NBA players pre- and post-COVID-19 disease, we found that players had no significant decline in their performance statistics after returning to play in the NBA regular season. Players had significantly decreased FGs made per game compared with the pre-COVID 2019-2020 season and increased FT attempts per game compared with career averages; however, the majority of the statistics assessed were not significantly changed. Given that the

**TABLE 1**  
Average Performance Outcomes From NBA Players With Prior COVID-19 Diagnosis: Pre-COVID Versus NBA Bubble Play<sup>a</sup>

	Pre-COVID <sup>b</sup>	NBA Bubble	Change, %	<i>P</i> Value
Games played	55.4	6.6	NA	NA
Minutes played	28.7	25.8	-10.0	<b>.04</b>
Points	14.5	12.9	-11.5	.06
Rebounds	5.7	5.1	-11.3	.13
Assists	3.7	3.5	-5.9	.23
Steals	0.9	0.8	-12.1	.30
Blocks	0.6	0.5	-6.7	.71
Turnovers	1.9	1.9	-1.6	.80
FG made	5.4	4.6	-15.6	<b>.02</b>
FG attempted	11.3	10.1	-10.5	.09
FG %	48.7	46.7	-4.1	.33
FT made	2.4	2.5	3.7	.56
FT attempted	3.1	3.3	6.5	.33
FT %	79.0	78.2	-1.0	.82
3P made	1.3	1.2	-4.9	.70
3P attempted	3.7	3.6	-3.6	.73
3P %	30.3	37.8	24.9	.19
Offensive rebounds	1.3	1.2	-9.8	.38
Defensive rebounds	4.5	3.9	-11.9	.11
Fouls	2.4	2.3	-1.6	.82

<sup>a</sup>Bolded *P* values indicate a statistically significant difference between groups ( $P < .05$ ). 3P, 3 point; FG, field goal; FT, free throw; NA, not applicable; NBA, National Basketball Association.

<sup>b</sup>2019-2020 regular season before the shutdown.

**TABLE 2**  
Average Performance Outcomes From NBA Players With Prior COVID-19 Diagnosis: Overall Career Versus NBA Bubble Play<sup>a</sup>

	Career	Bubble	Change, %	<i>P</i> Value
Minutes played	26.2	25.8	-1.4	.81
Points	12.4	12.9	3.5	.64
Rebounds	4.9	5.1	3.3	.69
Assists	3.1	3.5	11.9	.13
Steals	0.9	0.8	-12.1	.34
Blocks	0.5	0.5	1.0	.96
Turnovers	1.7	1.9	11.2	.21
FG made	4.6	4.6	0.1	.99
FG attempted	9.8	10.1	3.0	.68
FG %	47.3	46.7	-1.4	.73
FT made	2.2	2.5	14.2	.10
FT attempted	2.8	3.3	16.7	<b>.04</b>
FT %	78.4	78.2	-0.2	.96
3P made	1.1	1.2	13.2	.34
3P attempted	3.1	3.6	16.3	.12
3P %	31.0	37.8	22.1	.26
Offensive rebounds	1.2	1.2	-5.1	.69
Defensive rebounds	3.7	3.9	6.4	.42

<sup>a</sup>Bolded *P* value indicates statistically significant difference between groups ( $P < .05$ ). 3P, 3 point; FG, field goal; FT, free throw; NBA, National Basketball Association.

recovered players were playing in the novel setting of the NBA bubble after a prolonged layoff and that they played significantly fewer minutes, this study offers some useful insights. With all of the changing guidelines and uncertainty in the world of post-COVID professional sports, this study adds to the limited body of evidence supporting RTP for players who follow league-specific protocols.

SARS-CoV-2 is a virus that typically causes a syndrome of primarily respiratory flulike symptoms such as fever and cough.<sup>23</sup> However, various other symptoms have been associated with COVID-19 infection, including cardiac sequelae, sensory changes, and prolonged fatigue.<sup>5,8,19</sup> Young adults typically exhibit milder symptoms and a self-limited course, although wide variability in symptomatology has been described.<sup>1</sup> Reports have suggested that 18% to 59% of young adults may actually be asymptomatic carriers transmitting the disease.<sup>10,11,14</sup> While it is felt that younger patients with fewer medical comorbidities are less at risk for serious complications from COVID-19, limited data exist regarding the effect of infection on performance outcomes in professional athletes having recovered from the virus. Minimal data are available to suggest how players might perform after viral syndromes similar to COVID-19. A 2015 study suggested that players recovering from illness had an inverse relationship between games missed and team win percentage; however, individual player performance was not directly assessed.<sup>16</sup> As recovery from COVID-19 becomes more common in players that RTP across different sports, it will be crucial to recognize the severity of infectious symptoms to further characterize their disease and aid in future studies.

Before the COVID-19 pandemic, recommendations regarding allowing players with acute infectious illness to play in professional athletic competition were vague and controversial. Metz recommended a “neck rule,” where athletes with symptoms from the neck up were allowed to compete while those with symptoms below the neck were not allowed to compete or train.<sup>13</sup> Currently published recommendations for players convalescing from COVID-19 and hoping to RTP include symptom resolution and completion of preparticipation evaluation with a medical provider.<sup>17</sup> Additionally, players face strict guidelines for quarantine duration that may vary for each professional league. Guidelines for RTP for professional sport after COVID-19 disease have been described; the tenets for success involve frequent testing of players and staff, social distancing, mask wearing, and close symptom monitoring.<sup>6,14</sup>

The NBA bubble was a novel solution to the difficult issue facing professional sports leagues worldwide: how to safely resume play in the face of the COVID-19 pandemic. However, the bubble did present several new concerns. As a result of the prolonged layoff causing an abnormal offseason, players were at risk for injuries related to sloppy play and for decreased performance due to worsened stamina.<sup>18</sup> A study by Myer et al<sup>15</sup> examined the effects of an uncommon offseason in the 2011 National Football League Lockout; the authors noted a large increase in Achilles injury rate, which they attributed to the biomechanical and neuromuscular deficits present from the prolonged layoff. Another concern was how to deal with positive tests for

players and staff within the bubble. On August 19, 2020, it was reported that the NBA had successfully continued bubble play without any players testing positive.<sup>21</sup> Other potential concerns, such as the lack of home-court advantage and alteration of the schedule of the following 2020-2021 season, were proven to be relatively minor given the level of success for the NBA bubble format.

## Limitations

This study contains limitations that should be mentioned. The main limitation was our use of publicly available data to determine and collect participants. First, available data largely did not specify dates of infectious diagnosis or specifics about symptoms (duration, severity, type); thus, we could not comment on length of recovery before RTP. Second, the available data may have underreported the players that could be included in the study, especially given the number of players who chose to remain anonymous. Subsequently, the total sample size was small, which limited our ability to perform meaningful subgroup analysis. Additionally, the number of games played in the bubble to finish the regular season was limited to 8 games. Having a small sample size and number of games for comparison limited the generalizability of this study, even with the novel topic being investigated. The retrospective nature of the review may also have allowed for selection bias.

## CONCLUSION

For NBA players who recovered from COVID-19 and returned to play in the NBA bubble, the current study demonstrated that despite playing significantly fewer minutes per game, players largely did not perform statistically differently from either their pre-COVID 2019-2020 level of play or their career averages. While limited evidence exists for recovery and performance in RTP for professional athletes, this study suggests that in the short term, players affected by COVID-19 can expect to recover to their pre-COVID performance level.

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