



# National Football League Wide Receivers and Running Backs Have Decreased Production Following ACL Reconstruction: An Evaluation of Fantasy Football Performance as an Outcome Measure

Colin J. Burgess, D.O., Vivek Singh, M.D., M.P.H., Katherine A. Lygrisse, M.D., Kenneth Choy, B.A., Randy M. Cohn, M.D., and Adam Bitterman, D.O.

**Purpose:** To use fantasy football points as a simple measure alongside on-field statistics to compare performance in National Football League (NFL) offensive skill position players before and after anterior cruciate ligament (ACL) reconstruction. **Methods:** A retrospective review of all NFL quarterbacks (QB), running backs (RB), wide receivers (WR), and tight ends (TE) who sustained an isolated, unilateral ACL injury from 1988 to 2017 was conducted. Data were collected from public data sources, team releases, NFL injury reports, press releases, and other Internet resources. For each player, a matched control with similar demographics was identified. Their in-game performance post-ACL reconstruction was analyzed using fantasy football points as an outcome measure. **Results:** A total of 13 QBs, 30 RBs, and 29 WRs who underwent ACL reconstruction from 1988 to 2017 and who met inclusion criteria were retrospectively identified and reviewed. Of the 13 quarterbacks included in the study, there was no statistically significant difference in fantasy football points between the pre- and post-ACL reconstruction groups, as well as post-ACL and matched control groups. There was a statistically significant decrease in career fantasy football performance of running backs post-ACL reconstruction compared with matched control groups (129.6 vs 553.6;  $P < .0001$ ). There was also a statistically significant decrease in per game fantasy football points post-ACL reconstruction (4.4 vs 11.2;  $P < .0001$ ). Lastly, WRs also demonstrated a decrease in career fantasy football performance post-ACL reconstruction compared with matched controls (145.3 vs 460.9;  $P = .002$ ). In addition, they also had a decrease in per game fantasy football performance (5.0 vs 7.7;  $P = .042$ ). **Conclusions:** Quarterbacks did not have a statistically significant decrease in performance following ACL reconstruction based on fantasy football performance. Conversely, both running backs and wide receivers had decreased per game and career performance post-ACL reconstruction based on their fantasy football statistics. Furthermore, RBs had the largest decline in production each season over a 3-year period following ACLR compared to QBs and WRs, respectively. **Level of Evidence:** Level III, case-control study.

## Introduction

Anterior cruciate ligament (ACL) injury is a common and devastating injury, particularly in contact sports like American football.<sup>1–6</sup> As a result, understanding the impact of anterior cruciate ligament reconstruction (ACLR) in American football athletes is crucial to counseling patients after this injury and improving outcomes. Results of previous studies suggest that ACLR leads to a significant decrease in level of performance and career longevity among National Football League (NFL) athletes.<sup>7,8</sup> Among NFL players, offensive skill position players have been shown to possess the highest risk of ACL injury.<sup>9</sup> Additionally, many parameters and outcome measures have been used for evaluating performance after ACLR in this population, some of which include games played,

Donald and Barbara Zucker School of Medicine at Hofstra/Northwell, Plainview, New York, U.S.A. (C.J.B., K.A.L., R.M.C., A.B.); New York University Langone Health, New York, New York, U.S.A. (V.S., K.A.L.); and New York Institute of Technology – College of Osteopathic Medicine, Old Westbury, New York, U.S.A. (K.C.).

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Address correspondence to Colin J. Burgess, D.O., 888 Old Country Rd., Plainview, NY 11803, U.S.A. E-mail: [CBurgess1@Northwell.edu](mailto:CBurgess1@Northwell.edu)

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games started, in-game statistics, and multiple efficiency ratios used to condense a player's stats into individual numbers.<sup>2,7,10–12</sup> Despite many studies investigating this topic, a universal consensus to best compare a player's performance following ACLR remains an area of debate.

Fantasy sports is a game in which participants assemble virtual teams of real players in a professional sport and compete on the basis of the statistical performance of those players in actual games. It is estimated that ~60 million people in North America participate in fantasy sports annually, making fantasy football performance a generalizable metric of on-field performance.<sup>13</sup> Fantasy football points are a single numerical value used to assess a players' performance. Each offensive player accumulates points based on their on-field statistics. Therefore, we believe that these fantasy football points are a generalizable way to concisely evaluate performance in NFL players, including pre- and post-ACLR. This metric is likely to be more readily understood by patients compared to the traditionally used patient-reported outcome measures.

The purpose of this study is to use fantasy football points as a simple measure alongside on-field statistics to compare performance in NFL offensive skill position players pre- and post-ACLR. We hypothesize that the statistical performance based on fantasy football points of NFL offensive players will decrease after undergoing ACLR.

## Methods

A retrospective review of all NFL quarterbacks (QB), running backs (RB), wide receivers (WR), and tight ends (TE), who sustained an isolated, unilateral ACL injury from 1988 to 2017 was conducted using public injury data, from team releases, NFL injury reports, press releases, and other internet resources.<sup>4,5,8–11</sup> These data are available to the public; therefore, this study did not require approval from our institutional review board (IRB). Players who played at least three regular-season NFL games prior to their injury and at least three regular season NFL games after their injury were included in this analysis. Players with a prior ACL injury, concomitant ligamentous/meniscal injuries in the ipsilateral knee, or other reported concurrent injuries regardless of location were excluded from our analysis. Although regarded as an offensive skill position, tight ends were excluded from this study due to a small number of subjects for analysis.

Demographic data, such as age, body mass index (BMI; kg/m<sup>2</sup>), date of injury (DOI), date of return to play (RTP), and NFL experience were collected. Performance variables pertaining to regular-season play for the three-position groups both prior and after the injury year were also collected. For QBs, the performance variables collected included games played, starts,

completions, pass attempts, passing yards, touchdowns thrown, interceptions, rush attempts, rushing yards, and rush touchdowns. For RBs, the performance variables collected included games played, starts, rushing attempts, rushing yards, rushing touchdowns, receptions, receiving yards, receiving touchdowns, and time to return. For WRs, the performance variables collected included games played, starts, targets, receptions, catch percentage, receiving yards per reception, total receiving yards, touchdowns, yards per target, and time to return. These values were then converted to fantasy football points using the standard Entertainment and Sports Programming Network (ESPN) fantasy point system<sup>14</sup> through the use of unbiased in-game statistics available on [STATS.com](https://www.stats.com) and [Pro-Football-Reference.com](https://www.pro-football-reference.com) (Fig 1). Official NFL personnel collect all on-field statistics live, which are then reviewed and edited post-game to ensure the correct statistics are logged for each participating player. No underestimation or overestimation of fantasy points is possible, as they are solely dependent on the in-game statistics and performance of the player.<sup>15</sup>

Each QB, WR, and RB in the ACL injury cohort was matched to a player without a documented history of an ACL injury (control). Matching was based on the following parameters in decreasing order of importance: prior NFL seasons played, individual (non-average) performance statistics prior to index year, and BMI.<sup>4,5,7–10</sup> Index year was defined as a certain time point for each control that was analogous to the time at which an ACL injury occurred in the injury cohort. For example, if a player suffered an ACL injury 2 years into his NFL career, the index year for the control would be

Scoring	
Category	Points
<i>Passing</i>	
TD Pass	6
Every 25 Passing Yards	1
2-point Conversion	2
Interception Thrown	-2
<i>Rushing</i>	
TD Rush	6
Every 10 Rushing Yards	1
2-point Rushing Conversion	2
<i>Receiving</i>	
TD Reception	6
Every 10 Receiving Yards	1
2-point Receiving Conversion	2
<i>Miscellaneous Offense</i>	
Kickoff Return TD	6
Punt Return TD	6
Fumble Recovered for TD	6
Each Fumble lost	-2

\* TD: Touchdown

**Fig 1.** Standard fantasy football scoring.

**Table 1.** QB Pre-ACL Reconstruction in Cases Versus Preindex Year in Controls

	Case	Control	P Value
Age	27.23 ± 2.39	25.46 ± 2.96	.11
BMI	27.36 ± 1.41	27.42 ± 1.34	.92
NFL Experience	3.19 ± 2.71	3.19 ± 2.71	1.0
Games Played	35.69 ± 45.20	39.54 ± 34.24	.81
Games Played per seasons	8.49 ± 4.93	11.90 ± 3.54	.054
Starts	30.92 ± 38.13	34.69 ± 27.63	.78
Completions	597.61 ± 789.77	641.54 ± 541.77	.87
Attempts	987.69 ± 1276.98	1,110.07 ± 906.07	.78
Passing yards	6,873.31 ± 9,072.08	7,404.08 ± 6,422.46	.87
Touchdowns	46.62 ± 65.48	43.46 ± 40.58	.88
Interceptions	27.15 ± 31.42	35.54 ± 26.62	.47
Rush attempts	92.85 ± 137.47	99.08 ± 101.52	.90
Rushing yards	352.92 ± 738.95	367.54 ± 738.95	.95
Rushing touchdowns	3.15 ± 6.54	3.23 ± 4.28	.97
Fantasy points passing yards	274.93 ± 362.88	296.16 ± 256.90	.87
Fantasy points passing TD	186.46 ± 261.93	173.85 ± 162.34	.88
Fantasy points interceptions (Negative)	54.31 ± 62.84	71.08 ± 53.24	.47
Fantasy points rushing yards	35.29 ± 73.90	36.75 ± 45.57	.95
Fantasy points rushing TD	18.92 ± 39.26	19.38 ± 25.71	.97
Total fantasy points	461.30 ± 645.93	455.07 ± 415.32	.98

ACL, anterior cruciate ligament; BMI, body mass index; NFL, National Football League; QB, quarterback; TD, touchdowns.

two years into the control athlete’s career. The same demographic and performance variables were collected for both cohorts, and mean performance over time was calculated.

Mean performance values preinjury and preindex year were compared for each position group as were the postinjury and postindex year mean performance values. Preinjury and postinjury mean performance values were compared for each position group in both cohorts. Lastly, mean performance values were compared between both cohorts for each of the first three seasons following injury or index year for each position group, respectively.

**Statistical Analysis**

All data were organized and collected on Excel software (Microsoft Corporation, Richmond, WA). Continuous variables were evaluated and represented as means ± SD. Independent-sample, two-sided *t*-tests were used to test for significant differences. All statistical analyses and calculations were performed using SPSS v25 (IBM Corporation, Armonk, New York). A *P* value of less than .05 was used to determine the statistical significance of a finding. In addition, a post hoc power analysis was performed using G\*Power (version 3.1.9.7) to ensure adequate statistical power (≥80%) was achieved to fully elucidate significant findings.

**Table 2.** QB Pre-ACL Reconstruction Versus Post-ACL Reconstruction in Cases

	Before	After	P Value
NFL experience	3.19 ± 2.71	6.23 ± 3.27	<b>.016</b>
Games played	35.69 ± 45.20	58.00 ± 47.68	.23
Games played per seasons	8.49 ± 4.93	8.30 ± 3.74	.91
Starts	30.92 ± 38.13	42.69 ± 54.41	.53
Completions	597.62 ± 789.77	940.38 ± 1,223.36	.40
Attempts	987.69 ± 1,276.98	1,526.08 ± 1,922.55	.41
Passing yards	6,873.31 ± 9,072.08	11,191.46 ± 14,671.23	.38
Touchdowns	46.62 ± 65.48	68.08 ± 99.72	.52
Interceptions	27.15 ± 31.42	40.46 ± 45.10	.39
Rush attempts	92.85 ± 137.47	87.00 ± 101.46	.90
Rushing yards	352.92 ± 738.95	205.15 ± 289.19	.51
Rushing touchdowns	3.15 ± 6.54	2.54 ± 4.14	.78
Fantasy points passing Yards	274.93 ± 362.88	447.66 ± 586.85	.38
Fantasy points passing TD	186.46 ± 261.93	272.31 ± 398.86	.52
Fantasy points interceptions (Negative)	54.31 ± 62.84	80.92 ± 90.21	.39
Fantasy points rushing yards	35.29 ± 73.90	20.51 ± 28.92	.51
Fantasy points rushing TD	18.92 ± 39.26	15.23 ± 24.81	.78
Total fantasy points	461.30 ± 645.93	674.79 ± 949.23	.51

Bold value is statistically significant *P* < .05.  
NFL, National Football League; TD, touchdowns.

**Table 3.** QB Post-ACL reconstruction in Cases Versus Postindex Year in Controls

	After-ACL	Post-Index Year	P Value
NFL Experience	6.23 ± 3.27	8.54 ± 5.15	.19
Games Played	58.00 ± 47.68	95.69 ± 77.96	.15
Games Played per seasons	8.30 ± 3.74	9.29 ± 4.54	.55
Starts	42.69 ± 54.41	87.15 ± 79.58	.11
Completions	940.38 ± 1,223.36	1,718.77 ± 1,623.89	.18
Attempts	1,526.08 ± 1,922.55	2,910.77 ± 2,700.94	.15
Passing Yards	11,191.46 ± 14,671.23	20,002.54 ± 19,129.84	.20
Touchdowns	68.08 ± 99.72	11,792 ± 121.07	.26
Interceptions	40.46 ± 45.10	92.15 ± 87.62	.071
Rush Attempts	87.00 ± 101.46	166.15 ± 289.19	.085
Rushing Yards	205.15 ± 289.19	476.85 ± 413.40	.064
Rushing Touchdowns	2.54 ± 4.14	4.62 ± 4.00	.20
Fantasy Points Passing Yards	447.66 ± 586.85	800.10 ± 765.19	.20
Fantasy Points Passing TD	272.31 ± 398.86	471.69 ± 484.28	.26
Fantasy Points Interceptions (Negative)	80.92 ± 90.21	184.31 ± 175.24	.071
Fantasy Points Rushing Yards	20.52 ± 28.92	47.68 ± 41.34	.064
Fantasy points rushing TD	15.23 ± 24.82	27.69 ± 23.82	.20
Total fantasy points	674.79 ± 949.23	1,162.86 ± 1,116.13	.24

**Results**

A total of 13 QBs, 30 RBs, and 29 WRs were identified as having an isolated, unilateral ACL tear between 1988 and 2017, having previously played at least three regular-season NFL games prior to their injury and went on to play at least three regular-season NFL games following their injury. A post hoc power analysis confirmed that all findings were sufficiently powered to show actual statistical differences between the cohorts.

**Quarterbacks**

QB's within the injury cohort had similar demographics when compared to controls. There was no significant difference in QB performance between the injury cohort and controls prior to ACL injury or index year (Table 1). Following ACLR, QB's showed no statistically significant change in fantasy points or in performance variables except for NFL experience ( $P = .016$ ) (Table 2). While QB's showed decreased on-field performance and fantasy football points in the index year post-ACLR, there were

**Table 4.** QB Cases Versus Controls: Year One to Year Three

	Case	Control	P Value
1st Season passing yards	1,406.92 ± 1,569.91	2,371.00 ± 1,211.06	.10
1st Passing yards FP	56.28 ± 62.80	94.88 ± 48.44	.10
1st Interceptions FP (negative)	10.61 ± 11.06	23.67 ± 18.01	<b>.038</b>
1st Passing TD	32.92 ± 41.12	50.33 ± 28.15	.23
1st Rushing yards	395 ± 6.87	7.25 ± 6.14	.22
1st Rushing TD	0.92 ± 2.25	4.00 ± 3.91	<b>.023</b>
1st Total FP	83.45 ± 98.87	132. ± 69.07	.17
2nd Season passing yards	1,580.67 ± 1,666.76	2,391.42 ± 1,379.25	.21
2nd Passing yards FP	63.23 ± 66.67	95.66 ± 55.13	.21
2nd Interceptions FP (negative)	14.17 ± 16.55	22.50 ± 13.70	.19
2nd Passing TD	41.33 ± 47.86	58.33 ± 40.84	.36
2nd Rushing yards	3.49 ± 5.66	7.91 ± 8.53	.15
2nd Rushing TD	1.50 ± 3.73	2.00 ± 3.91	.75
2nd Total FP	95.39 ± 108.02	141.40 ± 86.35	.26
3rd Season passing yards	2,006.90 ± 1,769.95	1,906.92 ± 1,510.96	.89
3rd Passing yards FP	80.28 ± 70.80	76.28 ± 60.44	.89
3rd Interceptions FP (negative)	15.00 ± 10.03	21.33 ± 17.21	.32
3rd Passing TD	52.00 ± 52.63	50.37 ± 44.39	.95
3rd Rushing yards	5.94 ± 7.90	8.45 ± 7.98	.47
3rd Rushing TD	5.40 ± 7.72	2.50 ± 4.01	.30
3rd Total FP	128.62 ± 128.04	116.56 ± 90.49	.80

Bold values are statistically significant  $P < .05$ .

FP, fantasy points; QB, quarterback; TD, touchdowns.

**Table 5.** RB Pre-ACL Reconstruction in Cases Versus Preindex Year in Controls

	Case	Control	P Value
Age	22.47 ± 0.86	22.23 ± 1.01	.34
BMI	30.09 ± 1.48	30.74 ± 2.00	.16
NFL experience	4.03 ± 2.61	4.03 ± 2.61	1.00
Games played	53.17 ± 39.19	56.17 ± 37.77	.76
Games played per seasons	12.77 ± 3.24	13.70 ± 2.06	.19
Rush attempts	461.73 ± 413.42	837.10 ± 711.19	<b>.015</b>
Rush attempts per game	8.49 ± 5.96	14.34 ± 5.01	<b>&lt;.0001</b>
Rushing yards	2,025.73 ± 1,959.44	3,670.20 ± 3,161.64	<b>.019</b>
Rushing yards per attempt	4.24 ± 0.59	4.33 ± .43	.49
Rushing yards per game	36.48 ± 26.95	61.51 ± 21.01	<b>&lt;.0001</b>
Rushing yards per season	487.05 ± 370.53	845.73 ± 324.48	<b>&lt;.0001</b>
Rushing touchdowns	14.13 ± 15.36	26.17 ± 23.55	<b>.023</b>
Receptions	109.10 ± 128.34	123.63 ± 105.99	.63
Receiving yards	938.60 ± 1120.13	967.13 ± 787.80	.91
Receiving touchdowns	4.17 ± 7.14	3.17 ± 3.39	.49
Fantasy points rushing yards	202.57 ± 195.94	367.02 ± 316.16	<b>.019</b>
Fantasy points touchdowns	84.80 ± 92.17	157.00 ± 141.29	<b>.023</b>
Fantasy points receptions	109.10 ± 128.34	123.63 ± 105.99	.63
Fantasy points receiving yards	93.71 ± 78.78	96.71 ± 78.78	.91
Fantasy points receiving touchdowns	25.00 ± 42.87	19.00 ± 20.37	.49
Fantasy points total points	515.33 ± 500.53	763.37 ± 638.08	.099
Points per game	8.53 ± 5.33	13.31 ± 4.69	<b>.001</b>
Points per season	113.50 ± 75.83	182.28 ± 72.18	<b>.001</b>

Bold values are statistically significant  $P < .05$ .

ACL, anterior cruciate ligament; BMI, body mass index; NFL, National Football League; RB, running back.

no significant differences in any performance variables between the QBs in the injury cohort following ACLR (Table 3). No performance variable was statistically different between the two groups in the 2nd and 3rd seasons, respectively (Table 4).

**Running Backs**

RBs in the injury and control cohorts had similar demographic information. Differences in fantasy football points and on-field statistics between the two groups are listed in Table 5. Following ACLR, RBs had a

**Table 6.** RB Pre-ACL Reconstruction Versus Post-ACL Reconstruction in Cases

	Before	After	P Value
NFL experience	4.03 ± 2.61	1.77 ± 2.06	<b>&lt;.0001</b>
Games played	53.17 ± 39.19	18.03 ± 27.12	<b>&lt;.0001</b>
Games played per seasons	12.77 ± 3.24	6.51 ± 5.57	<b>&lt;.0001</b>
Starts	21.50 ± 21.91	8.33 ± 17.68	<b>.013</b>
Rush attempts	461.73 ± 413.42	132.37 ± 286.55	<b>.001</b>
Rush attempts per game	8.49 ± 5.96	4.08 ± 4.79	<b>.002</b>
Rushing yards	2,025.73 ± 1,959.44	553.00 ± 1,291.30	<b>.001</b>
Rushing yards per attempt	4.24 ± 0.59	2.44 ± 1.84	<b>&lt;.0001</b>
Rushing yards per game	36.48 ± 26.95	16.19 ± 20.71	<b>.002</b>
Rushing touchdowns	14.13 ± 15.36	170.54 ± 240.65	<b>.001</b>
Receptions	109.10 ± 128.34	26.43 ± 38.86	<b>.001</b>
Receiving yards	938.60 ± 1,120.13	191.67 ± 281.13	<b>.001</b>
Receiving touchdowns	4.17 ± 7.14	0.83 ± 1.29	<b>.015</b>
Fantasy points rushing yards	202.57 ± 195.94	55.30 ± 129.13	<b>0.001</b>
Fantasy points touchdowns	84.80 ± 92.17	23.80 ± 52.25	<b>0.003</b>
Fantasy points receptions	109.10 ± 128.34	26.43 ± 38.86	<b>0.001</b>
Fantasy points receiving yards	93.71 ± 78.78	19.16 ± 28.11	<b>0.001</b>
Fantasy points receiving touchdowns	25.00 ± 42.87	5.00 ± 7.73	<b>0.015</b>
Fantasy points total points	515.33 ± 500.53	129.60 ± 242.89	<b>&lt;0.0001</b>
Points per game	8.53 ± 5.33	4.43 ± 4.73	<b>0.003</b>
Points per season	113.50 ± 75.83	45.70 ± 53.29	<b>&lt;0.0001</b>

Bold values are statistically significant  $P < .05$ .

ACL, anterior cruciate ligament; NFL, National Football League; RB, running back.



**Table 7.** RB Post-ACL Reconstruction in Cases Versus Postindex Year in Controls

	After ACL	Postindex Year	<i>P</i> Value
NFL experience	1.77 ± 2.06	3.50 ± 1.88	<b>.001</b>
Games played	1.77 ± 2.06	44.70 ± 26.42	<b>&lt;.0001</b>
Games played per seasons	6.51 ± 5.57	12.37 ± 3.00	<b>&lt;.0001</b>
Rush attempts	132.37 ± 286.55	615.93 ± 447.44	<b>&lt;.0001</b>
Rush attempts per game	4.08 ± 4.79	12.97 ± 3.93	<b>&lt;.0001</b>
Rushing yards	553.00 ± 1,291.30	2,500.43 ± 1,932.18	<b>&lt;.0001</b>
Rushing yards per attempt	2.44 ± 1.84	3.88 ± 0.46	<b>&lt;.0001</b>
Rushing yards per game	16.19 ± 20.71	51.15 ± 18.86	<b>&lt;.0001</b>
Rushing touchdowns	170.54 ± 240.65	17.77 ± 16.10	<b>.001</b>
Receptions	26.43 ± 38.86	101.43 ± 84.89	<b>&lt;.0001</b>
Receiving yards	191.67 ± 281.13	789.47 ± 787.22	<b>&lt;.0001</b>
Receiving touchdowns	0.83 ± 1.29	2.77 ± 3.49	<b>.006</b>
Fantasy points rushing yards	55.30 ± 129.13	250.04 ± 193.22	<b>&lt;.0001</b>
Fantasy points touchdowns	23.80 ± 52.25	106.60 ± 96.63	<b>&lt;.0001</b>
Fantasy points receptions	26.43 ± 38.86	101.43 ± 94.89	<b>&lt;.0001</b>
Fantasy points receiving yards	19.16 ± 28.11	78.95 ± 7872	<b>&lt;.0001</b>
Fantasy points receiving touchdowns	5.00 ± 7.73	16.60 ± 20.94	<b>.006</b>
Fantasy points total points	129.60 ± 242.89	553.62 ± 446.20	<b>&lt;.0001</b>
Points per game	4.43 ± 4.73	11.18 ± 4.89	<b>&lt;.0001</b>
Points per season	45.70 ± 53.29	142.25 ± 74.34	<b>&lt;.0001</b>

Bold values are statistically significant  $P < .05$ .

ACL, anterior cruciate ligament; NFL, National Football League; RB, running back.

significant decrease in fantasy points and all performance variables (Table 6).

RBs had significantly worse performance and fewer fantasy points after ACLR compared to controls post-index year (Table 7). In the 1st seasons after ACLR, RBs had significantly decreased rushing yards ( $P < .001$ ), receptions ( $P = .013$ ), receiving yards ( $P = .009$ ), touchdowns ( $P < .001$ ) and total fantasy points ( $P < .001$ ) compared to controls. The 2nd season after ACLR, RBs did not statistically differ compared to controls. However, during the 3rd season after ACLR, RBs had significantly decreased rushing yards ( $P = .006$ ), touchdowns ( $P = .018$ ), and total fantasy points ( $P = .032$ ) compared with controls (Table 8).

**Table 8.** RB Cases Versus Controls: Year One to Year Three

	Case	Control	<i>P</i> Value
1st season rushing	28.37 ± 46.70	80.04 ± 41.11	<b>&lt;.0001</b>
1st reception	15.00 ± 14.23	28.67 ± 2150	<b>.013</b>
1st receiving	11.29 ± 10.82	22.77 ± 17.32	<b>.009</b>
1st TD fantasy points	14.73 ± 20.93	42.40 ± 29.22	<b>&lt;.0001</b>
1st total fantasy points	69.38 ± 84.28	173.87 ± 92.42	<b>&lt;.0001</b>
2nd season rushing	45.00 ± 40.32	72.50 ± 41.42	.70
2nd reception	19.00 ± 11.43	32.93 ± 23.26	.068
2nd receiving	13.75 ± 7.70	26.19 ± 20.21	.056
2nd TD fantasy points	29.72 ± 24.17	34.22 ± 27.94	.57
2nd Total FP	106.47 ± 76.29	159.91 ± 104.88	.091
3rd rushing	22.83 ± 28.20	72.16 ± 40.24	<b>.006</b>
3rd reception	15.86 ± 22.15	27.60 ± 20.62	.21
3rd receiving	10.86 ± 15.43	21.29 ± 16.30	.15
3rd TD fantasy points	8.57 ± 10.88	36.60 ± 28.27	<b>.018</b>
3rd Total FP	58.11 ± 71.87	150.14 ± 98.78	<b>.032</b>

Bold values are statistically significant  $P < .05$ .

FP, fantasy points; RB, running back; TD, touchdowns.

### Wide Receivers

WRs preinjury did not statistically differ in age, BMI, NFL experience, all performance variables, and fantasy points compared with preindex year controls (Table 9). Following ACLR, WRs had a significant decrease in NFL experience, statistical performance, and fantasy football points (Table 10).

Following ACLR, WRs had significantly decreased performance compared to postindex year controls with regard to NFL experience ( $P < .001$ ), number of games played ( $P < .001$ ), games played per season ( $P = .007$ ), targets ( $P < .001$ ), targets per game ( $P = .036$ ), receptions ( $P = .002$ ), receiving yards ( $P = .002$ ), receiving yards per game ( $P = .042$ ), receiving yards per season ( $P = .046$ ), touchdowns ( $P = .003$ ), and fantasy points in all areas (Table 11). However, when analyzing the first three seasons post-ACLR and post-index year, there were no significant performance or fantasy point differences between WRs who underwent ACLR and the controls (Table 12).

### Discussion

The results of our study show that while QBs achieved statistically equivalent on-field performance following ACLR compared to their preinjury state, as well as the postindex year control group, RBs and WRs had a significant statistical decrease in production following ACLR compared to their preinjury state, as well as the postindex year control group, respectively. This difference can be appreciated in fantasy football point decreases seen in both the RB and WR groups on a per game basis, as well as for the duration of their career (Table 13). An ACL rupture is

**Table 9.** WR Pre-ACL Reconstruction in Cases Versus Preindex Year in Controls

	Case	Control	P Value
Age	25.90 ± 3.11	25.43 ± 3.20	.58
BMI	26.71 ± 1.55	26.61 ± 1.23	.10
NFL experience	3.52 ± 3.18	3.52 ± 3.18	1.00
Games played	45.66 ± 46.65	46.59 ± 45.80	.94
Games played per seasons	11.62 ± 4.09	11.70 ± 4.76	.95
Targets	254.69 ± 354.99	303.21 ± 409.52	.63
Targets per game	4.18 ± 2.61	4.82 ± 3.02	.39
Reception	150.24 ± 217.10	180.21 ± 243.42	.62
Reception per game	2.41 ± 1.61	2.79 ± 1.84	.41
Catch%	52.38 ± 17.56	50.37 ± 19.13	.68
Receiving	2055.86 ± 3049.29	2,438.76 ± 3,333.74	.65
Yards per reception	13.13 ± 6.30	12.27 ± 5.11	.57
Rec yards per game	32.21 ± 21.48	37.93 ± 25.66	.36
Rec yards per season	425.14 ± 320.67	527.17 ± 374.50	.27
Touchdowns	13.14 ± 19.33	16.62 ± 22.58	.53
Yards per target	7.31 ± 3.20	6.84 ± 2.92	.56
Fantasy points receiving yards	205.59 ± 304.93	243.88 ± 333.37	.65
Fantasy points touchdowns	78.83 ± 116.00	99.72 ± 135.47	.53
Fantasy points receptions	150.24 ± 217.10	180.21 ± 243.42	.62
Fantasy points total points	434.66 ± 634.65	523.81 ± 709.02	.62
Points per game	6.87 ± 4.65	8.17 ± 5.56	.34
Points per season	90.75 ± 69.50	113.856 ± 81.56	.25

ACL, anterior cruciate ligament; BMI, body mass index; NFL, National Football League; WR, wide receiver.

a major injury for any individual, but it can be potentially devastating and career-altering for many high-level NFL athletes.<sup>7</sup> Between 21% and 37% of NFL athletes who suffer an ACL injury never appear in another NFL game.<sup>2,16</sup> Those who do RTP have been shown to perform at a lower level on average than they did before injury.<sup>2</sup> The physical demands imposed on NFL athletes predispose them to greater

injury risk in comparison to the general population. A previous analysis of relative injury risk for each position demonstrated that certain skill position players, specifically WRs, tight ends, linebackers, RBs, and fullbacks, face a significantly greater ACL injury risk than the rest of the NFL between the 2010 and 2013 NFL seasons.<sup>9</sup> However, despite the increased risk and consequences related to ACL injuries for these elite

**Table 10.** WR Pre-ACL Reconstruction Versus Post-ACL Reconstruction in Cases

	Before	After	P Value
NFL experience	3.52 ± 3.18	1.59 ± 1.38	<b>.004</b>
Games played	45.66 ± 46.65	17.59 ± 20.02	<b>.004</b>
Games played per seasons	11.62 ± 4.09	7.38 ± 6.28	<b>.004</b>
Starts	28.59 ± 40.52	11.00 ± 15.28	<b>.033</b>
Targets	254.69 ± 354.99	86.38 ± 121.70	.20
Targets per game	4.18 ± 2.61	3.01 ± 3.10	.13
Reception	150.24 ± 217.10	51.34 ± 74.00	.24
Reception per game	2.41 ± 1.61	1.83 ± 2.00	.23
Catch%	52.38 ± 17.56	40.08 ± 29.48	.059
Receiving	2,055.86 ± 3,049.29	681.31 ± 983.46	<b>.025</b>
Yards per reception	13.13 ± 6.30	9.73 ± 7.32	.063
Rec yards per game	32.21 ± 21.48	23.21 ± 24.44	.14
Rec yards per season	425.14 ± 320.67	287.91 ± 363.13	.13
Touchdowns	13.14 ± 19.33	4.31 ± 6.84	<b>.024</b>
Yards per target	7.31 ± 3.20	5.41 ± 3.87	<b>.047</b>
Fantasy points receiving yards	205.59 ± 304.93	68.13 ± 98.35	<b>.025</b>
Fantasy points touchdowns	78.83 ± 116.00	25.86 ± 41.01	<b>.024</b>
Fantasy points receptions	150.24 ± 217.10	51.34 ± 73.98	<b>.024</b>
Fantasy points total points	434.66 ± 634.65	145.34 ± 211.55	<b>.023</b>
Points per game	6.87 ± 4.65	4.97 ± 5.30	.15
Points per season	90.75 ± 69.50	61.51 ± 77.64	.14

Bold values are statistically significant  $P < .05$ .

ACL, anterior cruciate ligament; NFL, National Football League; WR, wide receiver.

**Table 11.** WR Post-ACL reconstruction in Cases Versus Postindex Year in Controls

	After ACL	After Index Year	P Value
NFL experience	1.59 ± 1.38	3.76 ± 2.38	<b>&lt;.0001</b>
Games played	17.59 ± 20.02	50.21 ± 37.34	<b>&lt;.0001</b>
Games played per seasons	7.38 ± 6.28	11.52 ± 4.82	<b>.007</b>
Targets	86.38 ± 121.70	284.62 ± 286.49	<b>.001</b>
Targets per game	3.01 ± 3.10	4.64 ± 2.67	<b>.036</b>
Reception	51.34 ± 74.00	165.59 ± 172.36	<b>.002</b>
Reception per game	1.83 ± 2.00	2.71 ± 1.61	.070
Catch%	40.08 ± 29.48	52.49 ± 19.84	.065
Receiving	681.31 ± 983.46	2,139.76 ± 2,144.00	<b>.002</b>
Yards per reception	9.73 ± 7.32	11.86 ± 4.47	.19
Rec yards per game	23.21 ± 24.44	35.92 ± 21.98	<b>.042</b>
Rec yards per season	287.91 ± 363.13	471.43 ± 321.25	<b>.046</b>
Touchdowns	4.31 ± 6.84	13.55 ± 14.41	<b>.003</b>
Yards per target	5.41 ± 3.87	6.86 ± 2.56	.098
Fantasy points receiving yards	68.13 ± 98.35	213.98 ± 214.40	<b>.002</b>
Fantasy points touchdowns	25.86 ± 41.01	81.31 ± 86.47	<b>.003</b>
Fantasy points receptions	51.34 ± 73.98	165.59 ± 172.36	<b>.002</b>
Fantasy points total points	145.34 ± 211.55	460.87 ± 466.75	<b>.002</b>
Points per game	4.97 ± 5.30	7.71 ± 4.72	<b>.042</b>
Points per season	61.51 ± 77.64	101.04 ± 68.49	<b>.044</b>

Bold values are statistically significant  $P < .05$ .

ACL, anterior cruciate ligament; NFL, National Football League; WR, wide receiver.

athletes, the utility of fantasy football points as a simple outcome measure to compare performance in NFL offensive skill position players pre- and post-ACLR remains unknown.

Although it is not yet widely accepted in the medical community, we believe that fantasy football data are a true objective way to measure performance in high-level professional athletes following an injury. It allows comparison of quantitative measures to determine whether an athlete can truly return to the same level of on-field performance following a major injury, such as an ACL tear. Additionally, fantasy football points are a recognized metric by athletes, as well as the general population. Therefore, the advantage of this study is that it allows the average American to easily discern the impact of ACLR versus traditional patient-reported

outcome measures. In addition, traditional patient-reported outcome measures may be limited in their generalizability due to a ceiling effect in high-level professional athletes. Further research is warranted to better understand whether fantasy football points are a reliable metric of postinjury performance and correlates with traditional patient-reported outcome measures.

A recent study by Provencher et al.<sup>17</sup> investigated the presence of symptomatic focal knee chondral injuries in NFL combine players using fantasy football points as one of their outcome measures. Although their study did not evaluate ACLR, the results were similar to our findings, as RBs and WRs with previously untreated knee chondral injuries were the only offensive players with significantly lower fantasy scores when compared with position-matched controls.<sup>17</sup> QBs achieved statistically similar fantasy scores as the control group. Carey et al.<sup>2</sup> found that player performance in NFL RBs and WRs who sustained an ACL tear was reduced by one-third and that more than 1 in 5 players never returned to an NFL game after this injury. Contrarily, a study published in 2021 by Manoharan et al.<sup>18</sup> found that although 61.8% of players (64.5% of RBs, 60% of WRs) returned to play at a mean of 13.6 months following ACLR, RBs had an insignificant drop in production. However, WRs who successfully returned to play demonstrated significantly decreased receiving yards, receptions per game, and receiving touchdowns per season when compared with the control group. This was validated by our findings in a prior study, which showed that WRs had a significant decrease in targets, receptions, receiving

**Table 12.** WR Cases Versus Controls: Year One to Year Three

	Case	Control	P Value
1st reception	34.55 ± 34.70	39.59 ± 25.58	.56
1st receiving	47.29 ± 47.20	57.13 ± 38.49	.45
1st TD fantasy points	18.30 ± 23.15	21.52 ± 19.61	.61
1st total fantasy points	100.14 ± 102.65	118.23 ± 78.30	.51
2nd reception	32.21 ± 32.87	38.37 ± 27.13	.55
2nd receiving	40.69 ± 41.52	49.69 ± 36.72	.50
2nd TD fantasy points	16.71 ± 16.50	18.44 ± 22.75	.80
2nd Total FP	89.62 ± 88.55	106.51 ± 82.85	.56
3rd reception	35.14 ± 20.16	38.95 ± 24.15	.76
3rd receiving	47.30 ± 26.46	48.48 ± 30.62	.92
3rd TD fantasy points	13.71 ± 13.29	21.79 ± 16.64	.22
3rd Total FP	96.16 ± 57.43	108.33 ± 67.94	.66

FP, fantasy points; TD, touchdowns; WR, Wide receiver.



**Table 13.** Fantasy Football Points Post-ACL Reconstruction Versus Postindex Year

Position	Per Game			Career		
	Post-ACLR	Postindex	<i>P</i> Value	Post-ACLR	Postindex	<i>P</i> Value
Quarterbacks	7.7 ± 6.4	10.1 ± 4.0	.34	674.8 ± 949.2	1,162.9 ± 1,116.1	.24
Running Backs	4.4 ± 4.7	11.2 ± 4.9	<b>&lt;.0001</b>	129.6 ± 242.9	553.6 ± 446.2	<b>&lt;.0001</b>
Wide Receivers	5.0 ± 5.3	7.7 ± 4.7	<b>.042</b>	145.3 ± 211.5	460.9 ± 466.8	<b>.002</b>

Bold values are statistically significant  $P < .05$ .

Values are expressed as means ± SD.

yards, and touchdowns along with playing 1.9 seasons fewer and fewer than half the number of games after undergoing ACLR compared with their postindex year-matched controls.<sup>8</sup>

While this study does not evaluate the percentage of players who return to competition following an ACL injury, our findings align with the aforementioned studies with regard to the decreased production of RBs and WRs following ACLR compared with their pre-injury on-field production as well as postindex year players who did not suffer such an injury. Therefore, evaluating athletes' performance by the position they play is important because of the different demands placed on athletes based on the various on-field positions. Possible factors that may have allowed return to professional play, but at a less productive level, can likely be attributed to persisting knee pain, stiffness, loss of strength, deconditioning, reduced proprioception, and fear of reinjury.

With regard to QB play, Erickson et al.<sup>11</sup> conducted a study that analyzed the performance and return-to-sport after ACLR and found that there was also no significant in-game performance difference between preinjury play and control QBs (index year) following ACLR. Other studies have also found no performance differences between QBs who have native or reconstructed ACLs.<sup>3,4,19</sup> Our results largely coincide with this finding; however, QBs in our study who underwent ACLR recorded fewer interceptions and rushing touchdowns during their 1st season upon return-to-sport but were statistically similar 2nd and 3rd year in comparison to the index year controls. A possible reason for these findings in QBs may be due to the difference in physical demands of the position compared to the RB and WR position groups. RBs and WRs are more likely to jump, pivot, and cut over the course of live game play, which may be why these position groups saw a decline in production following ACLR. Multiple factors affect the ability to perform in an elite capacity after ACLR, including previous physical conditioning and access to optimal rehabilitation after undergoing surgery.<sup>19</sup>

Contrary to the present study, Keller et al.<sup>20</sup> suggest that high-caliber athletes who participated in the NFL scouting combine between 2010 and 2014 can achieve equivalent levels of performance with no

statistically significant differences in 40-yard dash time, vertical leap, broad jump, shuttle drill, and 3-cone drill compared with matched controls. While these metrics may be similarly achieved in NFL skill position players post-ACLR compared with their pre-injury state; however, they do not necessarily translate to similar on-field production as our findings suggest.

### Limitations

This study is not without limitations. This includes a retrospective study design, the relatively small sample size, and the use of the fantasy football points as a nonvalidated performance metric. Furthermore, it is difficult to truly identify a control group while equalizing "talent" and "skill," which partially determine productivity and objective outcomes of these NFL athletes. Since our data were based solely on public information available on the internet, we could not account for the differing techniques for ACLR. However, multiple previous studies have cited that the vast majority of NFL players who sustain an ACL tear undergo arthroscopically assisted single-bundle bone-patellar tendon-bone reconstruction.<sup>1,21,22</sup> Thus, regardless of the possible variables in graft choice, surgical technique, and surgeon experience, it is likely that the majority of the athletes whom we reviewed had similar ACLR techniques and graft choices. Validated outcome scores evaluating high-level sports performance are still lacking; therefore, the performance measure used in this study may not truly reflect the actual on-field impact of the player. However, an advantage of using fantasy football points as an outcome tool is the consistent follow-up since the statistical data are documented annually and widely available to the public. Another limitation of our methodology is that injured players have already played a portion of their careers, and thus, the fewer number of games played after surgery may be due to the natural process of players nearing the end of their careers and not due to inferiority of their reconstructed knees. Despite these limitations, the present study suggests that RBs and WRs have a significantly decreased performance output upon returning from ACLR in comparison to their preinjury status, as well as postindex year counterparts, who did not suffer an ACL injury.

## Conclusion

QBs did not have a statistically significant decrease in performance following ACL reconstruction based on fantasy football performance. Conversely, both running backs and wide receivers had decreased per game and career performance post-ACL reconstruction based on their fantasy football statistics.

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