Characterization of Concussions in the National Basketball Association and the 90-Day Period following Return to Play: Analysis of Musculoskeletal Injury Risk and Player Performance

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INTRODUCTION: Concussions have previously been shown to have persistent changes in reaction time and postural stability in high level athletes. The effects of concussions on National Basketball Association (NBA) player performance and subsequent injury during the 90-day period following return to play (RTP) has not been investigated. The primary outcome was to determine the incidence of musculoskeletal (MSK) injury in the immediate 90-day period following RTP from concussion. The secondary outcomes were to evaluate player performance statistics within the 90-day period and time loss after MSK injury. The authors' hypothesized that following a concussion, players would be at a greater risk for MSK injury with an associated decrease in player performance.

METHODS: Concussions sustained by NBA players between the 2015-2016 and 2021-2022 seasons were evaluated using a publicly available database. The database was queried to identify any MSK injury in the 90-day post-RTP period after a concussion, along with time loss after injury. Performance statistics were obtained from each player's pre-index season and post-index season, as well as timepoints within the 90-day post-RTP period. Each injured player was matched 1:1 with a control using position, win shares, player efficiency rating (PER), and points per game. MSK injury incidence and player statistics in the concussion group were compared with controls.

RESULTS: Seventy concussions were identified in NBA players. 49 players sustained a MSK injury in the 90-day post-RTP period (70%). Compared to controls, the odds of sustaining a MSK injury in the concussed cohort was 11.3 times greater (95% confidence interval 5.04-25.2, P<0.001). Time missed after MSK injury was similar between the concussed and the control group (games: P=0.687; days: P=0.99). Comparisons over the 90-day post RTP period did not reveal any significant changes in points per game (PPG), minutes per game (MPG), true shooting percentage (TS%), or usage percentage (USG%) (P>.05). When compared to controls, no changes in performance statistics were significantly different (P>.05).

DISCUSSION AND CONCLUSION:

NBA players who sustain concussions are at a significantly increased risk for subsequent musculoskeletal injury within the 90-day post-RTP period. No significant changes in player performance were noted in the immediate 90 days after returning

returning			to	
Concussions summined in the NRA 4 trans 2015 to 2022 (n = 108)	TABLE 1	Including of Introduction Injury	TABLE 3 teristics for Concussed NBA athletes and thed Control NBA athletes	TABLE 4A Player Performance Before and After Concussion Periodox Postedox Season Secon I Chance P Value
Control 1:1 Mashada Control Population (n = 70) Control Indicated (n = 10) Control I	Age analogo y 25 s a 30 25 a 45 25 a 46 Height on 2012 8 5 200 9 5 4 2011 8 6 Height on 2012 8 5 200 9 5 4 2011 8 6 Height on 2012 8 a 1.5 26 5 a 2.1 36.8 a 1.5 Traition Center 12 (24) 6 (28) 18 (26) 18 (26) 19 Press Plenned 14 (25) 4 (19) 18 (26)	Concussion Control	Concussed Nonconcussed p- with MSK Control with Value Injury MSK Injury Value 0 49 12	MPG 215±22 241±24 25±34 0.97 PPG 81±10 189±13 29±15 0.064 TS% 0.541±,064 0.567±0.018 0.05±0.015 0.156 USON 177±0.8 187±12 1.0±0.7 0.139
(a = 70) Parlands Parlan	Provided Femous 14 (2.5) 4 (1.5) 1.5 (2.5)	Inscidence 0.70 0.17 Center MSK: musculoskeletal Power Forward Small Feward Shoring Guard Peint Canel	12 (24) 4 (33) 0.532 14 (29) 2 (17) 0.401 7 (14) 1 (8) 0.584 6 (12) 0 (0) 0.200 10 (20) 5 (42) 0.125	MFC training per game; PFC: points per game; 15%; true anothing percentage; USG% stage percentage
(n-4)	Reported as mean a standard deviation Reported at a (%) Reported as mean (major) MSK: musculoskeletal	*Number of Injuries (1 2 3 **Location of Injury (*)	37 (76) 9 (75) 0.971 8 (16) 1 (8) 0.484 4 (8) 2 (17) 0.375	
Regional on: 1. Beginnlar on: 1. Deprimer manaded 2. Time missed that to MSK Rejury MSK		Foot Anklo Lower Leg Knee Upper Leg	6 (12) 1 (8) 0.703 10 (20) 4 (33) 0.34 6 (12) 1 (8) 0.703 8 (16) 2 (16) 0.973 8 (16) 0 (0) 0.133 4 (8) 1 (8) 1 (8) 0.703	
Sub-Streep Androine 1. Compromet MSK Righter coloridors to remembel population troud and coloridors and colorid		Tesso Amrikacıldar Hard Wini Hedel Nock Retarn-b-play following NSSK hige	2 (4) 1 (8) 0.543 1 (2) 2 (16) 0.034 4 (8) 0 (0) 0.31	i i
Compet RIP Uniformed all SS Index to manhed periodism Pizzero 1: Flow chart demonstrating patient exclusions and ultimate		Ginnes Missed, me (mage) Days Missed, rean (mage) Out fee Sansen	in 5.0 (1-19) 5.8 (1-17) 0.685 12.6 (1-83) 12.6 (2-37) 0.99 8 (16.3%) 1 (8.3%) 0.484	
sub-groups used for the purpose of separate analysis.		Reported as n (%), unit	us otherwise indicated	