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Minutes Per Game and Usage Rate Associated with Time Loss after Ankle Injury

A Characterization of Foot and Ankle Injuries and Associated Risk Factors in National Basketball Association Athletes

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DISCLOSURES

- The authors' have no relevant disclosures

BACKGROUND

- Ankle injuries are among the most common in high school, collegiate and professional basketball players
- **Limited evidence regarding the frequency and risk factors of ankle injuries among modern NBA Athletes**

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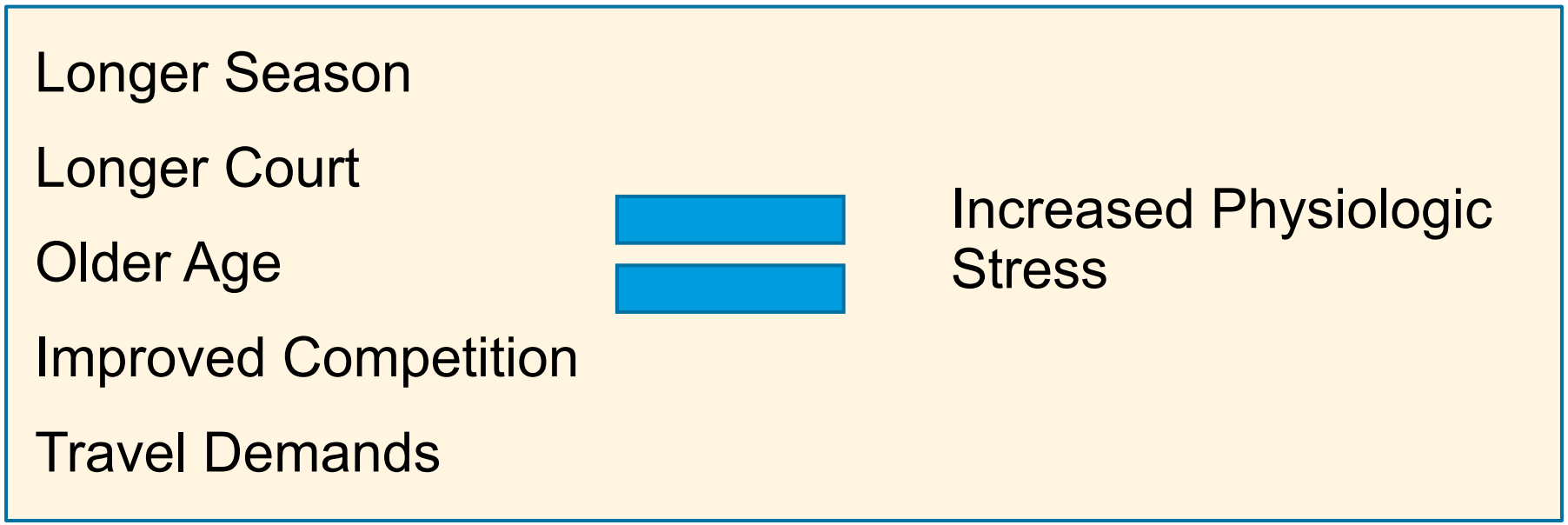
WHY IS THIS IMPORTANT?

- NBA players have a unique risk profile for injury



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PURPOSE

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- To characterize ankle injuries in NBA players
- To identify specific risk factors associated with structural ankle injury and games missed in NBA players
  - 2015-2020 seasons

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METHODS

- Publicly available player records of all NBA players from 2015-2020 seasons
  - Pro Sports Transactions was used to identified all active players with knee injuries missing >1 game
  - Each injury event verified using The Sports Network, Rotowire and Basketball-Reference
- 2019 season excluded due to abrupt suspension due to COVID pandemic

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VARIABLES COLLECTED

- Player Demographics
- Position
- Anthropometric measurements
- Injury Characteristics as reported
- History of other lower extremity injuries
- General Basketball Statistics
- Advanced statistics included:
  - Player Efficiency Rating (PER)
  - True Shooting Percentage (TS%)
  - Usage Rage (USG)

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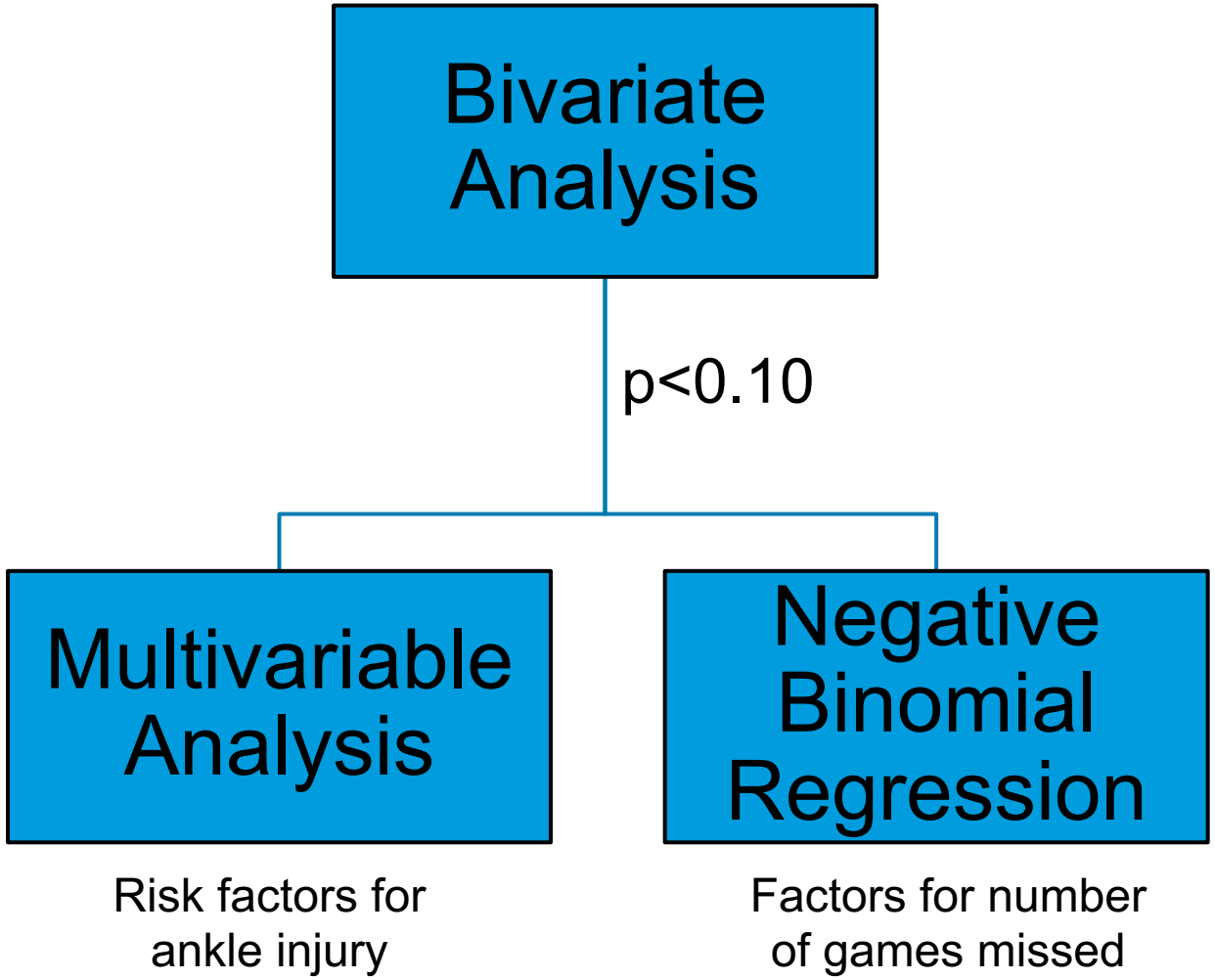
STATISTICAL ANALYSIS

- **Descriptive Statistics**
  - Injury events evaluated by type, position, age, and games lost
  - Reported per 1000 game exposures
- **Advanced Statistics**
  - Bivariate Analysis
    - Player demographics, basketball statistics, and a history of other lower extremity injuries
    - All variables with p<0.10 moved to multivariable regression and negative binomial analysis
  - Multivariable Regression Analysis
    - Evaluated risk factors for ankle injury
  - Negative Binomial Regression
    - Evaluated factors associated with the increased number of games missed



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RESULTS - EPIDEMIOLOGY

- 554 Ankle Injuries in 5 season cohort
  - 4.06 per 1000 GEs
- Sprain/Strain was common injury type
  - 3.71 per 1000 GEs
- Most ankle injuries were moderate in severity
  - Missed 2-10 Games
  - 2.22 per 1000 GEs

TABLE 1
Ankle Injury Totals and Incidences

Injury Type	No. of Injuries	Injury Incidence (per 1000 GEs)
Sprain/Strain	506	3.71
Contusion	7	0.05
Inflammation	8	0.06
Ligament tear	2	0.01
Plantar fasciitis	0	0.00
Fracture	6	0.04
Impingement	5	0.04
Bone spurs	3	0.02
Dislocation	1	0.01
Management/Unspecified	16	0.12
Total	554	4.06

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RESULTS – LIKELIHOOD OF SUSTAINING AND ANKLE INJURY

- The *likelihood* of sustaining an ankle injury was significantly associated with:
  - Greater number of games played (p=0.029)
  - Previous injury to the hip, hamstrings or quadriceps (p=0.004)

Table 3. Multivariable logistic regression analysis of factors associated with having an ankle injury among National Basketball Association (NBA) players.

	Odds Ratio (95% Confidence Interval)	Standard Error	*p*-value	Pseudo R^2
Variables				0.20
Followup duration (*years)*	1.5 (1.3 to 1.7)	0.10	**<0.001**	
Number of games played (*total*)	1.01 (1.00 to 1.02)	0.0048	**0.029**	
Minutes per game (*total)*	1.0 (0.96 to 1.1)	0.029	0.52	
Performance metrics				
Usage rate	1.0 (0.98 to 1.1)	0.027	0.28	
Player efficiency rating	0.99 (0.95 to 1.0)	0.023	0.73	
True shooting percentage	1.0 (0.99 to 1.0)	0.014	0.31	
Points per game	0.99 (0.90 to 1.1)	0.051	0.90	
Block percentage	1.0 (1.0 to 1.0)	0.0030	0.77	
Total rebound percentage	1.0 (0.92 to 1.2)	0.065	0.52	
Games missed due to injury	1.02 (1.00 to 1.04)	0.0099	**0.023**	
Other lower extremity injury†				
Foot	1.4 (0.91 to 2.2)	0.31	0.13	
Knee	0.80 (0.55 to 1.2)	0.16	0.27	
Calf or shin	0.86 (0.57 to 1.3)	0.18	0.45	
Hip, hamstring, or quadriceps	1.7 (1.2 to 2.4)	0.30	**0.004**	

*__Bold__ indicates statistical significance, $p<0.05$.
†Not having a specific foot, calf/shin, knee, or hip/hamstring/quadriceps injury was used as a reference standard.

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RESULTS – RISK OF INCREASED LENGTH OF ABSENCE

- Increased *length of absence* due to ankle injury was associated with:
  - Greater height (p=0.019)
  - Minutes per game (p<0.001)
  - Usage rate (p=0.025)
  - Points per game (p=0.011)
  - Prior history of foot (p=0.003), ankle (p<0.001), and knee injuries (p<0.001)

Table 4. Multivariable negative binomial regression analysis of factors associated with the number of games missed due to ankle injury among National Basketball Association (NBA) players.

	Regression Coefficient (95% Confidence Interval)	Standard Error	*p*-value	Pseudo R^2
Variables				0.024
Height (*meters*)	2.3 (0.37 to 4.2)	0.97	**0.019**	
Weight (*kilograms)*	0.010 (-0.0024 to 0.023)	0.0065	0.11	
Years of experience	0.057 (-0.018 to 0.030)	0.012	0.64	
Followup duration (*years)*	-0.094 (-0.17 to -0.014)	0.041	**0.021**	
Minutes per game (total)	0.072 (0.038 to 0.11)	0.017	**<0.001**	
Performance metrics				
Usage rate	0.031 (0.0039 to 0.058)	0.014	**0.025**	
Player efficiency rating	-0.0089 (-0.036 to 0.018)	0.014	0.52	
True shooting percentage	0.012 (-0.0020 to 0.026)	0.0071	0.095	
Points per game	-0.076 (-0.13 to -0.017)	0.030	**0.011**	
Block percentage	-0.0018 (-0.0056 to 0.0019)	0.0019	0.35	
Total rebound percentage	-0.096 (-0.19 to -0.0058)	0.046	**0.037**	
Lower extremity injury				
Foot	0.42 (0.15 to 0.69)	0.14	**0.003**	
Ankle	0.40 (0.20 to 0.60)	0.10	**<0.001**	
Calf or shin	0.14 (-0.11 to 0.38)	0.13	0.28	
Hip, hamstring, or quadriceps	0.22 (-0.0014 to 0.44)	0.11	0.052	
Knee	0.68 (0.45 to 0.92)	0.12	**<0.001**	

*__Bold__ indicates statistical significance, $p<0.05$.

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CONCLUSIONS/LIMITATIONS

- The incidence of ankle injuries was 4.06 per 1000 GEs in professional basketball players
- Games played and previous history of hip, hamstrings or quadriceps injuries were found to be risk factors for ankle injuries
- Factors associated with *physiologic burden* such as minutes per game and usage rate were associated with an increased time loss after injury
- Limitations
  - Injuries identified limited to those reported in media
    - Minor injuries may have been underreported
  - Injuries could not be confirmed with official medical records
  - Offseason and Practice Injuries not quantified

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