

Sleep Quality, Depression Symptoms, Reaction Time, and Injury Risk in College Basketball Players

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BACKGROUND AND PURPOSE

- Reaction time (RT) appears to be a critical component of athletic performance and may relate to injury risk¹
 - Sleep deprivation can result in slower RT, while also having a negative effect on mood and neurocognition²
- Extended sleep time (> 8 hours) has been associated with faster RT, improved mood, and improved athletic performance¹
 - Poor sleep quality and depression appear to be interrelated, both of which may adversely affect sport performance
- Limited evidence exists concerning the influence of poor sleep quality on visuomotor RT among college athletes
 - An unbalanced rest-to-activity cycle may increase susceptibility to sport-related injury³
- The purpose of this study was to assess possible interrelationships among self-reported sleep quality, self-reported depression symptoms, visuomotor RT, and injury incidence among male and female college basketball players

PARTICIPANTS AND PROCEDURES

- 25 NCAA Division-I basketball players; 13 male (20.8 ± 1.7 years) and 12 female (19.8 ± 1.5 years) basketball players
- Well-validated survey instruments used to quantify sleep quality and depression (total of 39 survey items)
 - Pittsburgh Sleep Quality Index (PSQI)⁴ and Center for Epidemiologic Studies Depression scale (CES-D)⁵
- Dynavision D2™ System (Dynavision International; West Chester, OH) used to assess visuomotor RT
 - Board height adjusted to position tachistoscope (T-scope) at eye level (Figures 1 and 2)
 - Participants instructed to maintain visual focus on T-scope and to hit targets when illuminated
 - A series of 3 practice trials (30 sec. each) preceded 3 test trials (60 sec. each) for both of 2 test modes:
 - Proactive: Targets remain illuminated (red) until hit; T-scope inactive
 - Reactive: Targets illuminated (red) for 750 ms; recitation of sentences displayed on T-scope
- Acute core or lower extremity (Core/LE) sprain or strain occurrences during practice sessions or games documented
 - Receiver operator characteristic (ROC) analyses performed to identify cut-points for dichotomous categorizations
 - Logistic regression analysis used to develop prediction models: 1) Core/LE sprain or strain, and 2) Ankle sprain

Figure 1



Figure 2



RESULTS

- 10 players sustained a Core/LE sprain or strain between initiation of pre-season practices and end of season
 - 5 ankle sprains, 3 knee sprains, 1 sacroiliac sprain, 1 quadriceps strain
- Cross-tabulation analyses identified 2 factors strongly associated with Core/LE sprain or strain occurrence
 - Proactive RT ≥ 745 ms: 50% sensitivity, 87% specificity (Table 1)
 - Reactive RT ≥ 715 ms: 50% sensitivity, 80% specificity (Table 2)
 - Analysis of combined factors failed to yield better prediction than Proactive RT alone
- Cross-tabulation analyses demonstrated that all 4 factors were strongly associated with Ankle sprain occurrence
 - Proactive RT ≥ 745 ms: 60% sensitivity, 80% specificity (Table 3)
 - Reactive RT ≥ 715 ms: 80% sensitivity, 65% specificity (Table 4)
 - PSQI ≥ 6: 80% sensitivity, 60% specificity (Table 5)
 - CES-D ≥ 11: 80% sensitivity, 60% specificity (Table 6)
 - Logistic regression analysis retained all 4 predictors for a multivariable Ankle sprain prediction model
 - ROC analysis identified ≥ 3 factors as best model: 80% sensitivity, 90% specificity (Figure 3 and Table 7)

Table 1 Proactive Reaction Time – Core/LE Injury

Cut-Point	Injury	No Injury
≥ 745	5	2
< 745	5	13
Total	10	15

OR: 6.50 (90% CI: 1.28 – 33.04)

Table 2 Reactive Reaction Time – Core/LE Injury

Cut-Point	Injury	No Injury
≥ 715	5	3
< 715	5	12
Total	10	15

OR: 4.00 (90% CI: 0.91 – 17.69)

Table 3 Proactive Reaction Time – Ankle Sprain

Cut-Point	Injury	No Injury
≥ 745	3	4
< 745	2	16
Total	5	20

OR: 6.00 (90% CI: 1.03 – 34.90)

Table 4 Reactive Reaction Time – Ankle Sprain

Cut-Point	Injury	No Injury
≥ 715	3	5
< 715	2	15
Total	5	20

OR: 4.50 (90% CI: 0.80 – 25.26)

Table 5 PSQI – Ankle Sprain

Cut-Point	Injury	No Injury
≥ 6	4	8
< 6	1	12
Total	5	20

OR: 6.00 (90% CI: 0.82 – 43.73)

Table 6 CES-D – Ankle Sprain

Cut-Point	Injury	No Injury
≥ 11	4	8
< 11	1	12
Total	5	20

OR: 6.00 (90% CI: 0.82 – 43.73)

Figure 3

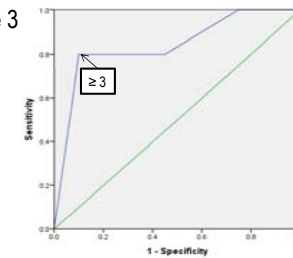


Table 7 4-Factor Ankle Sprain Prediction Model

Factors +	Injury	No Injury
≥ 3	4	2
0, 1, or 2	1	18
Total	5	20

OR: 36.00 (90% CI: 3.95 – 328.23)

CLINICAL RELEVANCE

- Visuomotor RT appears to be an indicator of susceptibility to basketball-related Core/LE sprain or strain
 - 50% of players who sustained a Core/LE sprain or strain exhibited slow Proactive RT and slow Reactive RT
 - No association to Core/LE sprain or strain was found for depression or sleep quality
- Visuomotor RT (both Proactive and Reactive), PSQI, and CES-D were all associated with Ankle sprain occurrence
 - Players who exhibited ≥ 3 of the 4 risk factors were 36 times more likely than others to sustain an ankle sprain
 - All of the identified risk factors are potentially modifiable, which may guide efforts to reduce injury susceptibility
- More research will be needed to verify these findings and to establish the effectiveness of preventive measures
 - Both sport performance and injury risk appear to be affected by visuomotor RT, sleep quality, and mental health
 - Pre-participation screening may identify athletes who are likely to derive benefits from targeted interventions

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