

Relative Rest Correlates to Winning Percentage in 2022 National Football League Season: A Preliminary Study

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ABSTRACT

The purpose of this investigation was to examine whether season average relative rest (RR) influences winning percentage (WIN%) in professional American Football. We define RR as the difference in rest intervals between teams from prior games. To address this, we analyzed each game played in the 2022 NFL season ($n=271$) and calculated rest intervals between each successive game for each team. The rest interval was defined as the number of days between the schedule start for each successive game, with all teams being assigned a rest interval of 0 during Week 1. Each team's RR was then determined by subtracting the opposing team's rest interval. The RR for each game for all teams were then averaged across the season. Subsequently, a correlation between season average RR and WIN% was performed and a tertial split in season average RR was conducted to separate teams into HIGH (teams 1-11), MID (teams 12-21) and LOW (teams 22-32). A one-way ANOVA comparing WIN% between HIGH, MID and LOW was then conducted while independent samples t-tests were employed to assess season average RR between teams with records above (WIN) and below 0.500 (LOSE) and those qualifying (PO) and not qualifying (NPO) for the playoffs. Data indicate that a significant positive relationship exists between WIN% and season average RR ($r=0.338$; $p = 0.029$). Moreover, successful teams (WIN/PO) had significantly greater season average RR than unsuccessful teams (LOSE/NPO). Therefore, a team's rest interval, relative to their opponent was associated with the outcome of the competition

during the 2022 NFL season.

Keywords: American Football, Performance, Recovery

INTRODUCTION

American football is a popular sport that requires high power output and involves high-velocity sprinting, as well as several accelerations and decelerations each game (7,27) resulting in increased physiological demands (6). As a result, it is not surprising that a prior report indicate reduced peak force and power during both the squat and counter movement jumps over the course of a football game (14). Biomarkers indicative of muscle damage, like creatine kinase (CK) and myoglobin, also increase following competitive games in those that played versus did not play (14,19), which appears to be a consistent finding between seasons (22). Moreover, the pro-inflammatory cytokine, tumor necrosis factor α (TNF α), was also demonstrated to increase following a scrimmage among Israeli national team members (15), while perceived recovery has been shown to be suppressed for as long as four days following competitive National Collegiate Athletics Association (NCAA) D-I football games (11). Consequently, the effects of one game likely impact subsequent performances, indicating that the effects of each game may compound over the course of a season.

Interestingly, prior reports have indicated no changes in myoglobin or CK in response to competitive

games over the course of a season (13), with possible improvements in recovery characteristics (12). However, it is important to consider the level of competition as both studies (12,13) utilized NCAA D-III players. When examining the effects of an entire football season in higher level competition (NCAA D-I), Kraemer et al (18) suggested that playing time likely influenced the post-game increases in CK following the final game of the season while Stone and colleagues (23) demonstrated increased CK concentrations over the course of the season, with augmented concentrations in starters versus non-starters. Collectively, these data demonstrate that at high levels of competition, the effects of a single American Football game in conjunction with training (9) can compound over the course of a season, increasing markers of muscle damage (23) and possibly reducing performance.

The National Football League, (NFL) is the preeminent professional football league in North America. Currently, the season is structured over the course of 18 weeks, with 17 games being played by each team, allowing for one bye week that occurs between Weeks 6 and 14 (30). As of 2006, the NFL introduced regular Thursday night football games (4), shortening the time between some games considerably. Given the previously discussed potential compounding effects of competitions, teams may be at an advantage over their competitors if they just completed their bye week or played the prior Thursday. This highlights the potential importance of different rest intervals between teams, indicating the relative rest (RR), which we define as a comparative ratio of the rest interval between games for each team, may be an important consideration for leagues to use while scheduling games. Therefore, the purpose of this investigation was to assess whether RR intervals were associated with the winning percentage (WIN%) of NFL teams. We hypothesized that season average RR and WIN% have a positive relationship, and that significant differences in WIN% would be apparent between teams with different levels of RR. Moreover, we hypothesized that season average RR would be higher in both teams that qualified for the playoffs, and teams with a winning record.

METHODS

Experimental Approach to the Problem

To assess whether RR impacted a team's WIN%, each team's season average RR was calculated

and correlated with their final WIN%. Additionally, a tertial split was performed based on season average RR, grouping teams into three groups: HIGH (teams ranked 1-11), MID (teams ranked 12-21) and LOW (teams ranked 22-32), with WIN% compared between these groups. Lastly, teams were also separated based on WIN% into teams above (WIN) and below 0.500 (LOSE) as well as teams qualifying for the playoffs (PO) and not qualifying for the playoffs (NPO). The season average RR was then compared between these groups.

Participants and Ethical Approval

This investigation analyzed each game played in the 2022 NFL season as individual cases (n=271) from publicly available data. All games played during the 2022 NFL regular season were included in this investigation. Importantly, one game (Buffalo Bills at Cincinnati Bengals; January 2, 2023) was canceled due to an on field medical emergency, leaving these teams playing only 16 games instead of the scheduled 17 (25). This investigation was submitted to the University IRB, and determined to not be Human Subjects Research, and therefore exempt from IRB review.

Data Analysis

To investigate the relationship between teams' season average RR and WIN%, the rest interval for each team was established for each of their games. Rest interval was defined as the number of days between the scheduled start for successive games. For example, a team playing a Thursday night (8:20PM EST) game in week one, and a Sunday late afternoon game in week two (4:05PM EST), would have a rest interval of 9.822 days. Game data was initially downloaded from www.profootballreference.com, and confirmed through spot checking games on www.NFL.com. During Week 1, every team was assigned a rest interval of 0, resulting in no difference between teams for their relative rest during this week. Preseason games were excluded from consideration as the results did not count toward the teams' final WIN%. Each team's RR was then determined by subtracting their opposing team's rest interval. Therefore, a positive RR indicated a team had more rest than their opponent, and a negative RR indicated less rest than their opponent. Each team's RR was then averaged across the season to determine their season average RR.

Statistical Analysis

Data were initially assessed for normality, using the Shapiro-Wilk test. Then, a Pearson Product Correlation was performed between season average RR and WIN%. Next, a one-way ANOVA, with LSD pairwise comparisons was used to assess differences in WIN% between HIGH, MID and LOW, while independent samples t-tests were used to compare differences in season average RR between WIN vs LOSE and PO vs NPO. Statistically significant findings were further assessed by Cohen's d to assess effect size for each comparison. Effect sizes were qualitatively defined as previously described [Small: 0.2; Medium: 0.5; Large: 0.8; Very Large: 1.3; (1)]. All data were analyzed using SPSS version 28 (IBM, Armonk, NY), with significance defined as $\alpha \leq 0.05$.

RESULTS

Descriptive data for all 32 NFL teams during the 2022 season are presented in Table 1. A significant positive correlation between WIN% and season average RR was observed ($r = 0.338$, $p = 0.029$; Figure 1). When comparing WIN% between HIGH, MID and LOW, no significant difference was observed (Table 2). Interestingly, however, significant differences were observed when comparing season average RR between WIN vs LOSE and PO vs NPO (Table 2). A moderate effect

was observed for WIN vs LOSE ($d = 0.706$) and for PO vs NPO ($d = 0.709$).

DISCUSSION

Our data indicate that a team's season average RR was positively related to and accounts for as much as 11.4% of the variance in team's WIN%. Though no differences were observed in WIN% between teams with HIGH, MID and LOW RR, successful teams (WIN and PO) had significantly higher RR than unsuccessful teams (LOSE and NPO). Moreover, the differences between success categories demonstrated a moderate effect on RR. Collectively, these results support the notion that increased rest, relative to an opponent, predicted a greater likelihood of winning the contest.

To our knowledge, no study to date has examined the relationship between RR and WIN% in any professional sport league. Nonetheless, these results are not surprising given the data surrounding the large workloads associated with an American Football game (6,27) and their corresponding effects on skeletal muscle damage (14,19,22), inflammation (15) and the time course of perceived recovery (11). Though no investigations have previously addressed the specific role of RR on performance and season success, prior work in professional soccer players supports these results and have demonstrated that limited rest between games

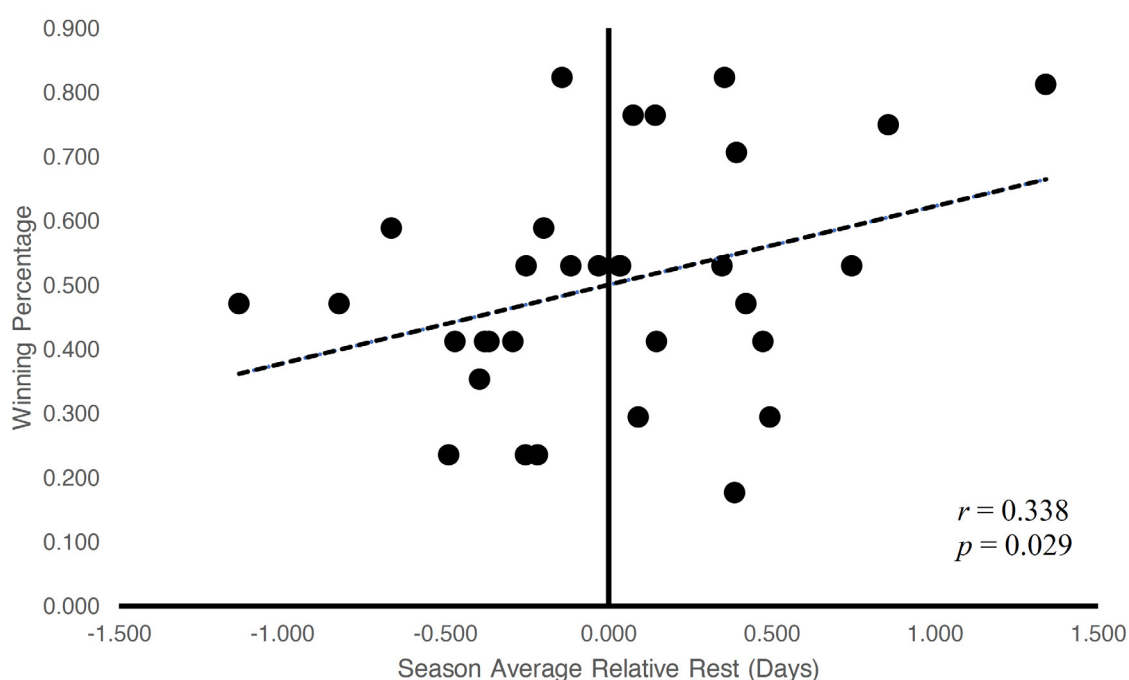


Figure 1. Correlation between the Season Average Relative Rest (RR) and winning percentage (WIN%).

Table 1. Team Descriptives

| Team | RR | Win% | Team | RR | WIN% |
|-----------------------|--------|-------|-----------------------|----------------|-------|
| Arizona Cardinals | -0.217 | 0.235 | Las Vegas Raiders | -0.395 | 0.353 |
| Atlanta Falcons | -0.365 | 0.412 | *Los Angeles Chargers | -0.198 | 0.588 |
| *Baltimore Ravens | -0.664 | 0.588 | Los Angeles Rams | 0.091 | 0.294 |
| *Buffalo Bills | 1.341 | 0.813 | *Miami Dolphins | 0.349 | 0.529 |
| Carolina Panthers | 0.474 | 0.412 | *Minnesota Vikings | 0.076 | 0.765 |
| Chicago Bears | 0.387 | 0.176 | New England Patriots | -1.132 | 0.471 |
| *Cincinnati Bengals | 0.857 | 0.750 | New Orleans Saints | -0.471 | 0.412 |
| Cleveland Browns | 0.148 | 0.412 | *New York Giants | 0.035 | 0.529 |
| *Dallas Cowboys | 0.392 | 0.706 | New York Jets | -0.379 | 0.412 |
| Denver Broncos | 0.496 | 0.294 | *Philadelphia Eagles | -0.142 | 0.824 |
| Detroit Lions | 0.746 | 0.529 | Pittsburgh Steelers | -0.253 | 0.529 |
| Green Bay Packers | -0.826 | 0.471 | *San Francisco 49ers | 0.144 | 0.765 |
| Houston Texans | -0.490 | 0.235 | *Seattle Seahawks | 0.037 | 0.529 |
| Indianapolis Colts | -0.253 | 0.235 | *Tampa Bay Buccaneers | 0.421 | 0.471 |
| *Jacksonville Jaguars | -0.116 | 0.529 | Tennessee Titans | -0.292 | 0.412 |
| *Kansas City Chiefs | 0.357 | 0.824 | Washington Commanders | -0.030 | 0.529 |
| | | | RR | WIN% | |
| MEAN (SD) | | | 0.004 (0.507) | 0.501 (0.184) | |
| RANGE | | | -1.132 to 1.341 | 0.176 to 0.824 | |

Season Average Relative Rest (RR) and winning percentage (WIN%) for every team. Teams that qualified for the playoffs are notated by an asterisk (*).

Table 2. Comparison of Relative Rest between levels of success.

| | WIN% | RR | n | t / F | p |
|------|---------------|----------------|----|-------|-------|
| WIN | 0.645 (0.125) | 0.183 (0.487) | 16 | 2.105 | 0.022 |
| LOSE | 0.357 (0.097) | -0.175 (0.476) | 16 | | |
| PO | 0.658 (0.131) | 0.206 (0.485) | 14 | 2.095 | 0.022 |
| NPO | 0.379 (0.111) | -0.153 (0.479) | 18 | | |
| HIGH | 0.538 (0.214) | 0.543 (0.328) | 11 | 2.162 | 0.133 |
| MID | 0.559 (0.193) | -0.032 (0.128) | 10 | | |
| LOW | 0.412 (0.108) | -0.502 (0.273) | 11 | | |

All data presented as Mean (SD)

RR: Season Average Relative Rest; WIN%: Winning Percentage.

WIN: Winning Season; LOSE: Losing Season; PO: Playoff Team; NPO: Non-Playoff Team

increases injury rates (14), along with reducing both physical (24) and tactical performance (10).

Though American Football competitions are known to reduce performance (14) and perceived recovery for at least four days (11), the effects of injury on overall team performance should also be considered. The Workload-Etiology model (29) suggests that as modifiable internal risk factors, such as fatigue increase, so does the risk of injury. Given that American Football games are known to involve high accelerations and decelerations, along with multiple collisions each game (6,7,27), it is not surprising that injury rates are nine times higher in

competition when compared to training in college players (5). Moreover, up to 78% of injuries sustained during competition are considered contact injuries (5,28). With a possible positive relationship between injury rates and the level of competition (8,21), this becomes particularly concerning among professional American Football players. Given the prior evidence of the possible compounding impact of a football season on markers of recovery and evidence gleaned from other sports, it stands to reason that reduced rest, and possibly RR across a season may increase the likelihood of injuries on a specific team, thereby decreasing the performance of the team. As we did not address injuries in the

present study, future research is warranted to examine the potential relationship between RR and injuries in professional sport.

Though load management is a common consideration in professional basketball (20), football and strength and conditioning coaches alike may want to consider the use of various load management techniques with their players. This is likely especially important to consider in weeks their team has a RR disadvantage. Though this investigation did not consider specific training load metrics, future investigations should seek to identify which metrics most relate to on-field performance, and how these variables differ between position groups (6,27). This will help provide a more detailed description of the effects RR may have on performance of an individual, rather than simply considering team success.

The primary limitation of this investigation was that only one season was examined. Therefore, future investigations should examine whether the observed influence of RR on WIN% is present in seasons other than the 2022 season. While the focus of this paper was strictly the effect of rest, relative to an opponent, there are several other concerns that should also be addressed in future investigations, including the travel associated with competition, as well as the influence of changes in time zone and the possible disruptions to sleep and training schedules (2,3,17,26). Moreover, future work should also address whether changes in the NFL scheduling practices, such as the addition of Thursday night games each week (4) influences this relationship and whether changes in season average RR predict the injury rates within specific teams.

PRACTICAL APPLICATIONS

These data indicate that greater average RR predicted a greater WIN%, likelihood of being over 0.500 and of making the playoffs during the 2022 NFL season. Therefore, coaches may want to consider the use of various load management techniques during both games and training, especially in weeks they have a RR disadvantage to minimize the deleterious effects of subsequent game performances. Finally, to maintain competitive parity, American Football leagues of any level should consider the RR of their teams while constructing the season schedule.

CONFLICTS OF INTEREST

No authors report any actual or potential conflicts of interest.

FUNDING

This study received no specific funding in order to be completed.

ETHICAL APPROVAL

This investigation was submitted to the University IRB, and determined to not be Human Subjects Research, and therefore exempt from IRB review.

DATES OF REFERENCE

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