Elite football injury risk explained: translating 1000-hour injury rates into expected weekly injury counts

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Injury rate | Injury count | Players health | Benchmark

Headline

Injury risk assessment and prevention strategies were reported to be the first topics of interest for practitioners working in elite football – clearly ahead of other important areas such as load and player monitoring, developing and assessing players' value, and decision-making approaches [1]. This is likely related to the fact that injuries in elite football have now been shown to negatively impact team performance and result in significant financial costs [7].

The wealth of research carried out on injury demographics and analytics has continued to grow over recent years, with large data sets on injury type, location, frequency and duration available. Popular methods among practitioners for data-driven injury analysis involve counting the frequency and severity (days lost) of past injuries, as well as their incidence rates based on the time exposed to games and training sessions [8]. While those published studies are likely to be of interest to practitioners trying to assess their own situation against those standards, it is sometimes difficult to put those numbers into practice. For example, the average injury rate is reported to be between 7 and 8 [6, 8] injuries per 1000 hours of combined training and match exposure, but how does this translate into a weekly rate of injuries for a typical squad of 25 players?

Aim

In this short paper, we aim to explain those reported injury rates in simple terms, so that a team may find them more useful in assessing their own injury context. This is not meant to be a rigorous analysis; instead, it is meant to build intuition and understanding in practical terms when these numbers are quoted. To do this, we consider different scenarios representing training practices at the elite level of football [2]. We express the injury rate per actual week of (training and match) exposure rather than the typical 1000 hours of exposure.

Methods

- Exposures are composed of the weekly total of training and match durations (hours) from representative elite football teams (Tables 1 and 2)
- Benchmarks for the injury rate per 1000 hours of exposure are the following [6, 8]:
  - Training:~ 4 injuries / 1000 hours of training exposure
  - Match: 24 to 36 injuries / 1000 hours of match exposure
  - Overall: 6.6 to 8 injuries / 1000 hours of overall exposure

Scenario 1 - One match per week

- Context
  - Squad: 25 players
  - Team training: group sessions of 75 min. in average over 5 days + 1 substitute compensation session + 1 day off (Table 1)
  - Matches: 1 per week (about 45-50 matches per season including league and a few cup matches)

Scenario 2 - Two matches per week scenario

- Context
  - Squad: 25 players
  - Training: 75 min. in average, 3 group sessions over 3 days + 1 substitute compensation session + 1 day off (Table 3)
  - Matches: 2 per week (about >55 matches per season including league and a few cup matches)

Table 1. Potential training and match distribution for a team playing once a week.

Training		M	T	W	T	F	S	S
1st (11)	Training	OFF	75	2 × 75	75	75	-	
Rest (14)		OFF	75	2 × 75	75	75		75
1st (11)	Match	-	-	-	-	-	90	-
Rest (7)		-	-	-	-	-	-	-

While some rest sessions may be longer than others, we chose an average session duration of 75 min [2]. Note that while 3-5 substitutes would have likely participated in the match, all match minutes are aggregated for the starters here for simplicity. To be consistent with the literature, game warm-up is not included in the exposure. We also assumed that all 7 substitutes and the other 7 non-selected players would compensate at D+1 on Sunday [2]. Durations are in minutes.

Table 2. Detailed calculation for weekly exposure and expected number of weekly injuries for scenario 1.

Exposure Type	Weekly Exposure (hours)	Time to reach 1000 hours (weeks)	Expected Number of Injuries per week
Training	$(25 \times 75 \times 5) + (14 \times 75 \times 1) +$ $= 174$	6	$4/6 = 0.67$ i.e., about 2 injuries every 3 weeks
Match	11×1.5 $= 16.5$	60	Between 24/60 and 36/60 $= [0.4, 0.6]$ i.e., about 1 match injury every 2 weeks
Overall (match and training)	$174 + 16.5$ $= 190.5$	5	Between 6.6/5 and 8/5 $= [1.3, 1.6]$ i.e., about 3 injuries every 2 weeks

Table 3. Potential training and match distribution for a team playing twice a week.

Training		M	T	W	T	F	S	S
1st (11)	Training	75	75	-	-	75	-	OFF
Rest (14)(7*)		75	75	-	75	75	60*	OFF
1st (11)	Match	-	-	90	-	-	90	-
Rest (4)		-	-	-	-	-	30	-

While some sessions may be longer than others, we chose an average session duration of 75 min [2]. Note that while 3-5 substitutes would have likely participated in the match, all match minutes are aggregated for the starters here for simplicity. To be consistent with the literature, game warm-up was not included in the exposure. While we assumed that they would compensate at D+1 after the Wednesday match, they would typically compensate on game day for the Saturday match, since Sunday is a day off. In the latter case, substitutes' training minutes are split into the 60 min work performed by the 7 non-selected players who may train at the training ground and the work of the 4 other selected substitutes who may not have played at all and may train for 30 min immediately at the stadium after the match [2]. Durations are in minutes.

Table 4. Detailed calculation for weekly exposure and expected number of weekly injuries for scenario 2.

Exposure Type	Weekly Exposure (hours)	Time to reach 1000 hours (weeks)	Expected Number of Injuries per week
Training	(25 × 75 × 3) + (14 × 75 × 1) + (4 × 30 × 1) + (7 × 60 × 1) =120	8	0.5 i.e., about 1 injury every 2 weeks
Match	11 × 1.5 × 2 = 33	30	Between 24/30 and 36/30 = [0.8, 1.2] i.e., about 1 match injury every week
Overall (match and training)	120 + 33 = 153	7	Between 6.6/7 and 8/7 = [1.0, 1.2] i.e., about 1 injury every week

Conclusion

We have presented a simplified approach of injury rate while expressing the typical rate per 1000 hours of exposure [6, 8] into expected count per actual week of (training and match) exposure. This likely makes it easier for practitioners to assess their own injuries as they accumulate during the season. Overall, practitioners may simply keep "one injury a week" as the overall injury benchmark.

Importantly, the benchmarks examined in this paper relate to all injuries irrespective of their location, severity, mechanism (i.e., contact vs. non-contact). Therefore, practitioners should bear this in mind and adjust the rates where there are studies available to back that up. For example, in order to isolate muscle/tendon injuries, one may decrease the rate by a factor of two approximately [6, 8]. The ability to provide similar benchmarks at the position level would also improve the approach, since it is clear that both the frequency of injury occurrence and the types of injuries differ in relation to the demands of the activity for each role (e.g., goalkeeper vs. forward vs. defenders).

It is also worth noting that due to the lack of evidence for greater injury rates at the team level during congested vs. non-congested periods of play [3-5], both case studies above were treated similarly. The results may suggest monthly injury rates are slightly higher for teams consistently playing only once vs. consistently playing twice a week (6 vs. 4 per month). While this may be at odds with common beliefs, it simply amounts to the greater overall exposure when playing only one match a week (190 vs. 153 hours / week) - but this is obviously not suggesting that playing more often would be associated with a reduced risk per se.

Finally, the injuries rates reported in this paper are related to the actual training volumes and patterns of the experimental team created here, based on the latest practical evidence [2]. Teams training more, or less, could therefore expect slightly greater and lower weekly injury rates, respectively. Some important risk factors are also obviously not considered in this simplified analysis. It is clear that teams with specific player profiles (e.g., many older players) or teams following particular load management strategies may expect slightly different weekly injury counts.

Practical applications

- Expected injury counts per actual week of (training and match) exposure are easier to understand for practitioners than the typical injury rate per 1000 hours.
- Practitioners can consider "one injury a week" as the overall injury benchmark.
- Teams competing once a week and reporting more than 3 injuries every second week (>6 per month) may display higher-than-normal injury rates.
- Teams competing twice a week and reporting >1 injury per week (or >4 injuries per month) may display higher-than-normal injury rates.
- Practitioners may use those benchmarks to assess their current situation, and may take some preventive actions accordingly (e.g., profiling players for improved prevention work, load management, or players recovery, sleep and nutrition education).
- Technology that can empower a higher level of understanding and insights on a day-to-day basis would be valuable (i.e., realtime alarms embedded into an athlete management system).

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