



COMMUNICATING THE RISK OF INJURY IN SCHOOLBOY RUGBY

MAKING THE EPIDEMIOLOGY MEANINGFUL

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AIM OF PAPER

To provide parents and children with meaningful data on the risks of injury from competitive school rugby, enabling them to make more informed decisions about participation.

“Injuries are just a part of the game...”

“Exercise should not be discouraged...”

“A few injuries are good to toughen kids up...”

“Parents shouldn’t wrap their kids in cotton wool...”

RATIONALE

- Why are Youth Rugby Injuries a matter for concern?

- Rugby is the most popular world-wide collision sport and is a significant cause of spinal and other serious injuries:-

One children's hospital in Australia reported 125 rugby-related cervical spine injuries to children under 15 years of age over a 3-year period (Browne, 2006)

Rugby causes of the largest number of concussions of any organised sport; collisions with other people being the most common mechanism leading to such injury (Browne, 2006)

- A survey of parents found that rugby was the sport for which participation was discouraged most frequently because of injury and safety concerns (Boufous, 2004)
- Participation in competitive rugby remains a compulsory element of the sports curriculum in many schools across the UK

BACKGROUND STUDIES

The Current Epidemiology

- Numerous observational studies have attempted to quantify the risk associated with competitive participation in school rugby:-

The epidemiology is most commonly communicated as a population measure rate of *Injuries per 1000 Player-Hours*

- The incidence of injury varies substantially between studies:-
7 - 129.8 injuries per 1000 player-hours
- Injury rates are primarily dependent upon the **definition of injury** adopted during the study observation period.
- IRB Consensus statement published in 2008 to encourage methodological consistency between studies, in order to make the results more comparable.

OTHER KEY FACTORS RELATED TO INJURY:

- Situation
- Age-Group / Level of Play
- Player Position
- Phase of Play
- Period of Rugby Season

COMMUNICATING THE RISK OF INJURY

INJURIES PER 1000 PLAYER-HOURS

- The concept of exposure-based incidence rates is unfamiliar to parents and children and makes the risk of injury from participation difficult to understand...An 'informed' decision ???

- However,

Injury Risk should consider both frequency and severity of injury within a context of player exposure to the sport (Fuller, 2007)

Optimal comprehension of risk is achieved using probability theory (Lipkus, 2007; Calman, 2002)

- Injury risk in sport has recently been compared with risk of occupational injury:-

Occupational injury statistics are normally described for public reading using probability theory...

Not as injury incidence rates per worker-exposure! (Fuller, 2008)

IMPROVING INJURY RISK COMMUNICATION USING A POISSON DISTRIBUTION

- Population incidence rates can be transformed into more meaningful data on risk so that individual players are provided with a probability of average injury, using a model based on the Poisson Distribution
- Poisson distribution predicts the probabilities of the different possible numbers of injuries resulting from a particular time exposure to the sport conditional on the assumed hazard rate (incidence).
- Therefore a Poisson Model:
 - *Considers Injury Risk within a context of player-exposure.*
 - *Provides parents and children with a Probability of Injury.*

– METHOD

- The probability of ‘ x ’ number of injuries in total time ‘ t ’ (hours) of play
- $P(x) = \frac{(\lambda t)^x e^{-\lambda t}}{x!}$, for $x=0,1,2,\dots$ where:
- λ = incidence of injuries per hour
(e.g. for 43.3 injuries per 1000 player-hours, $\lambda = 0.0433$. This figure is within the range reported from published studies)
- t = time-interval, hours
[e.g. for 15 matches, $t = 15 \times (70/60) = 17.5$ hours]
- e = base of the natural logarithm ($e = 2.71828\dots$)
- $x!$ = factorial of ‘ x ’

AN EXAMPLE

Table shows the probabilities of different numbers of injuries occurring to a single player from an exposure to 17.5 hours of play (i.e. 15 games completed games) and with an incidence rate of 43.3 injuries per 1000 player-hours.

They show that there is a 53% OR approx. 1 in 2 chance of a given player (subject to this injury rate) getting injured in a season of 15 games.

Number of Injuries from 15 matches exposure	Probability
0	47%
1	36%
2	14%
3	3%
4	1%
P (atleast 1 Injury) = 53%	

APPROXIMATE CONVERSION TABLE

INJURY INCIDENCE RATE (Number of Injuries)	LIKELIHOOD OF INJURY TO AVERAGE PLAYER IN A 15-MATCH SEASON	ODDS OF INJURY (Approximations)
< 10 per 1000 player-hours	< 16%	< 1 in 6
10 - 19 per 1000 player-hours	16 - 30%	< 1 in 3
20 - 39 per 1000 player-hours	31 - 50%	< 1 in 2
40 - 60 per 1000 player-hours	50 - 65%	> 1 in 2
> 60 per 1000 player-hours	> 65%	1 in 1

AGE-GROUP & RISK OF INJURY

TABLE 1 – TRANSLATION OF INJURY INCIDENCE RATES TO PROBABILITIES OF INJURY

STUDY	INJURY DEFINITION	POPULATION (Schoolboys; Ages)	INJURY INCIDENCE RATE (Number of Injuries)	LIKELIHOOD OF INJURY TO AVERAGE PLAYER IN A SEASON
Davidson 1987 (Australia)	Injuries that required attention at the school sport's clinic	<13	13.6 per 1000 player-hours	21%
		14-15	18.4 per 1000 player-hours	28%
		>16	25.6 per 1000 player-hours	36%
McIntosh 2008 (Australia)	Injury required treatment or removal from pitch	<13	43.3 per 1000 player-hours	53%
		<15	56.3 per 1000 player-hours	63%
		<18	63 per 1000 player-hours	67%
Durie 2000 (New Zealand)	Injury causes player to leave field or complain at end of the match.	<13	19.6 per 1000 player-hours	29%
		<15	25 per 1000 player-hours	35%
		<17	25 per 1000 player-hours	35%

INJURY DEFINITION & RISK OF INJURY

STUDY	INJURY DEFINITION	POPULATION (Schoolboys; Ages)	INJURY INCIDENCE RATE (Number of Injuries)	LIKELIHOOD OF INJURY TO AVERAGE PLAYER IN A SEASON
Nathan 1983 (South Africa)	Injury prevents rugby participation for at least one week	<10 - <19	8.4 per 1000 player-hours	14%
Nicol 2009 (UK) Scottish Pilot Study	Injury prevents rugby participation for at least one week	11-18	10.8 per 1000 player-hours	17%
Junge 2004 (New Zealand)	A physical complaint	14-18	129.8 per 1000 player-hours	90%

LIMITATIONS

- HETEROGENEITY

The Poisson Model assumes the characteristics of the individual match those of the population from which the injury data are drawn. However, internal and external characteristics are likely to differ between athletes placing some more at risk of injury than others.

For instance, we know that some positions are more prone to injury than others.

The results that we have shown hold in an average sense, with some players having perhaps a greater risk and others a lower one.

RECOMMENDATIONS

- To overcome the limitation of heterogeneity we require more comprehensive:
 - Injury Surveillance
 - Data Collection
 - Data Publication
- This would allow us to infer the conditional injury rates and risks in various situations. This would enhance our understanding of injury risks and aid injury prevention.

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