

# Infographic. Workload in throwing dominant sports: an infographic summary

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Substantial interest in the concept of workload and its applications to training and injury prevention programmes is evident in the literature. The majority of the published data regarding workload surrounds lower extremity-based sports involving running activities such as track and field events as well as soccer. However, there has been an increased interest in the workload concept related to throwing and overhead sports in recent years. In particular, cricket, baseball, softball, volleyball, water polo, handball and lacrosse have been studied.<sup>1,2</sup> Unfortunately, as a result of inconsistency in monitoring workload accurately, current methods are not well suited to workload monitoring in throwing-dominant sports.<sup>1</sup> In order to be accurate, definitions used for injury and volume need to be consistent. In particular, one must first define workload. Second, factors associated with workload should be divided into internal and external risk factors.<sup>1,3,4</sup> Each subset of risk factors may impact injury risk differently. Internal workload often referred to as 'effort' may include rate of perceived exertion and/or heart rate, and fitness (eg, positive physiological adaptations).<sup>1,5</sup> External workload is defined as the load applied to the body from an external source such as volume of throws in a day, week or season. Furthermore, external load data have been consistent that the volume of throwing is associated with increased injury risk in cricketers as well as baseball pitchers.<sup>5-7</sup> Throwing injuries are thought to result due to repeated microtrauma from repetitive throwing.<sup>5</sup> When applying the acute to chronic workload concept, data do indeed suggest that large increases in acute workload are associated with increased injury risk.<sup>6</sup> In throwing and overhead dominant sports, there is a need for balance of recovery and training to minimise overuse injury and improve performance. As a result, other factors besides volume of throwing need to be taken into consideration. These may include non-load related risk factors such as sleep quality and quantity, previous injury and muscle strength. In addition, other factors include but are not limited to intensity and velocity of throwing, effort of throws and rest from throwing weekly, monthly, and over a calendar year, age of participation in sport

## Workload in Throwing Dominant Sports: An Infographic Summary

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### 1 What is known about workload in throwing dominant sports?

- There is more research on lower extremity-based sports involving running activities e.g., track + field.
- There is growing research on workload in throwing overhead sports such as:
 

Cricket
Softball
Volleyball
Handball

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### 2 How to improve workload monitoring:

- By using consistent definitions in the literature for injury, workload and volume.

### 3 What factors are associated with workload?

- Factors associated with workload should be well balanced into 2 categories:
 

Internal

External

Internal factors = effort	External factors = external sources
 Heart rate	 Sleep, rest and recovery
 Mental readiness	 Large increases in workload
 Rate of perceived exertion	 Volume (number of throws/pitches)

### 4 How to minimize injury and improve performance:

- Avoid acute increases in workload.
  - There are specific factors to consider for throwing and overhead dominant sports:
 

Volume of throwing
Velocity of throwing
Effort of throws
Environment
- Balance recovery and training to minimize overuse injury and improve performance.
  - Workload monitoring may help give clues why an injury occurred.
  - Treatment should focus on:
    - Workload monitoring of pitch/throw volumes
    - Rest periods
    - Kinetic chain programs
    - Throwing injury prevention programs
    - Previous injury and muscle strength

and environmental factors such as participating in an extremely warm or cold climate outdoors.<sup>1,2,5-7</sup>

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