teachers guide

Motion 4: Sporting injuries

Components

	NAME	DESCRIPTION	AUDIENCE
	Sporting injuries teachers guide	This guide describes how a video and data analysis exercise can be used to extend students' understanding of force and motion in sport.	teachers
	Forces in action: knee injuries video	A video features UWA biomechanics research into knee injuries in AFL.	students
	Analysing sporting injuries worksheet	Students analyse data into incidence of injury in various sports. Differences between sports is linked to patterns of force and motion.	students

Purpose

To **Elaborate** on students' understanding of effects of forces on the human body, through a context of sporting injuries.

Outcomes

Students:

- apply Newton's laws of motion to understand forces acting on objects in one or two dimensions, in real life situations;
- appreciate impacts of sporting injuries on participants and society;
- analyse data on incidence of sporting injuries; and
- understand the role of science in minimising sporting injuries.

Activity summary

ACTIVITY	POSSIBLE STRATEGY
Teacher shows the video, *Forces in action: knee injuries*, then poses questions: • What main type of injury can knees suffer if excessive or abnormally directed forces act on them? • What are possible consequences of such an injury for a sportsperson? • What are costs to society of such injuries?	teacher poses questions
Students complete worksheet, *Analysing sporting injuries*.	individually
Class discusses responses to worksheet questions.	teacher-led activity small group discussion

Technical requirements

The teachers guide and worksheet require Adobe Reader (version 5 or later), which is a free download from www.adobe.com. The worksheet is also available in Microsoft Word format. QuickTime version 7 or later is required to view the video. This is a free download from www.apple.com/quicktime.

A high-quality MP4 version of the video with subtitles is also available on CD-ROM or download from the SPICE website.

Information for teachers

The video, *Forces in action: knee injuries*, contains the following scenes:

DURATION	CONTENT
00:00–00:34	action from AFL and netball games …
00:34–01:57	incidence of injuries in AFL and netball … 5.2 million sports injuries, cost $1.8 billion (2004) … Under-14 year olds are largest group admitted to hospital with sports injuries (2006). Injury-prone sports include: AFL; basketball; netball … Common AFL injuries happen to lower limbs (ankles, knees …).
01:57–04:10	image of knee and model showing bones, ligaments … UWA scientist describes how knee ligaments control leg movements; and typical knee injuries, especially to the ACL. Under normal circumstances bones, muscles, tendons and ligaments withstand large forces. The majority of ACL injuries happen in non-contact situations.
04:10–07:13	Tim Doyle describes UWA research; shows force platform and treadmill; and describes data they provide (speed, acceleration, force, power …). Tim shows Vicon camera and computer interface, and describes how it can be used to measure knee forces. Data are collected and graphed while an athlete runs on a treadmill. Tim explains what the data indicates about forces on the subject's knees.
07:13–07:30	Presenter describes the AFL study and use of data to inform posture and balance for footballers and development of training drills to minimise injury risk.
07:30–08:32	ACL reconstruction can lead to 5–12 month absence from sport.

Using the worksheet, *Analysing sporting injuries*

Students use a worksheet, *Analysing sporting injuries*, to investigate comparative injury rates between different sports.

Data in this worksheet are drawn from a study by the Victorian Injury Surveillance Unit that analysed hospital admissions, due to sporting injuries, over a three-year period from 1 July 2007 to 30 June 2010. Students need to allow for differing popularities of sports in analysing these data. This can be done using estimates of sport participation rates published by the Australian Sports Commission.

Additional data that categorise the site of injury into four groups are available. These can be analysed with reference to differing characteristics of sports. For example, injuries to lower limbs (leg, knee, foot …) are characteristic of sports that involve rapid changes of direction, such as badminton, squash and netball. Students are asked to interpret these data using all information they have gained on forces and motion in the human body.

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SPICE resources and copyright

All SPICE resources are available from the Centre for Learning Technology at The University of Western Australia ("UWA"). Selected SPICE resources are available through the websites of Australian State and Territory Education Authorities.

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Associated SPICE resources

Motion 4: Sporting injuries may be used in conjunction with related SPICE resources to address the broader topic of motion.

DESCRIPTION	LEARNING PURPOSE
Motion (overview) This learning pathway shows how a number of SPICE resources can be used to teach concepts of motion.	
Motion 1: Unbalanced forces and motion Images from various sports stimulate discussion of effects of forces on motion of objects.	**Engage**
The sequence overview contains suggested **Explore** activities suitable for use at this point.	**Explore**
Motion 2: Profile of a runner A 100 m race is used as a context for analysing motion, velocity and acceleration.	**Explain 1**
Motion 3: Tennis ball motion Students use equations of motion to analyse slow-motion footage of a bouncing tennis ball.	**Explain 2**
Motion 4: Sporting injuries A biomechanist and surgeon provide perspectives on knee injuries in athletes. Data on injuries, for a range of sports, are analysed. Students make connections between prevalence of injuries and forces in the human body.	**Elaborate**