2020 Anatomy & Physiology (B&C) – Overview

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DISCLAIMER - This presentation was prepared using draft rules. There may be some changes in the final copy of the rules. The rules which will be in your Coaches Manual and Student Manuals will be the official rules.

BE SURE TO CHECK THE 2020 EVENT RULES **for EVENT PARAMETERS and TOPICS FOR EACH COMPETITION LEVEL**

TRAINING MATERIALS:

- **Training Power Point** presents an overview of material in the training handout
- **Training Handout** presents introductory topic content information for the event – an **Overview Handout and Training Handouts for Each System – Integumentary, Skeletal, Muscular**
- **Sample Tournament** has sample problems with key
- **Event Supervisor Guide** has event preparation tips, setup needs and scoring tips
- **Internet Resource & Training Materials** are available on the Science Olympiad website at www.soinc.org under Event Information.
- **A Biology-Earth Science CD, an Anatomy/A&P CD (updated 2019)** as well as the **Division B and Division C Test Packets** are available from SO store at www.soinc.org

BASIC ANATOMY AND PHYSIOLOGY

- **Skeletal System**
- **Muscular System**
- Integumentary System
- Major Diseases
- Treatment and prevention of diseases

Systems *–Anatomy & Physiology (B/C) with rotating 3 body systems each year on a 4 year rotation schedule*

Year 1	**Skeletal**	**Muscular**	**Integumentary**	**(2020 and 2024)**
Year 2	**Nervous**	**Sense Organs**	**Endocrine**	**(2021and 2025)**
Year 3	**Respiratory**	**Digestive**	**Immune**	**(2022 and 2026)**
Year 4	**Cardiovascular**	**Lymphatic**	**Excretory**	**(2023and 2027)**

PROCESS SKILLS - observations, inferences, predictions, calculations, data analysis, and conclusions.

Students may be asked to examine images from X-ray, CT scans or MRI to see bone, tendon, ligament and soft tissues of the body. Following is some background that compares these types of images.

The difference between X-rays, CT scans and MRI

X-Rays

- X-rays are the most common and widely available diagnostic imaging technique.
- Even if a patient may need a more sophisticated test, they will often receive an X-ray first.
- X-rays use radiation to produce images of the body. When the rays pass through the body, dense objects—such as bones—appear white on the film.
- X-rays are typically used to view and diagnose bone disease, degeneration, fractures, dislocations, infections and tumors.
- Though often used to examine skeletal structures, an X-ray can also be used to look at other internal structures, such as organs.
- In this case, the patient may given barium sulfate or dye to make the organs stand out more clearly in the X-ray image.
- During an X-ray, the part of the body that is being looked at will be placed between an X-ray machine and photographic film.
- The machine then sends electromagnetic waves (radiation) through the body, reflecting the patient's internal structures on the exposed film.
- Although the amount of radiation used for an X-ray is not considered dangerous, doctors will take certain precautions if the patient is pregnant.

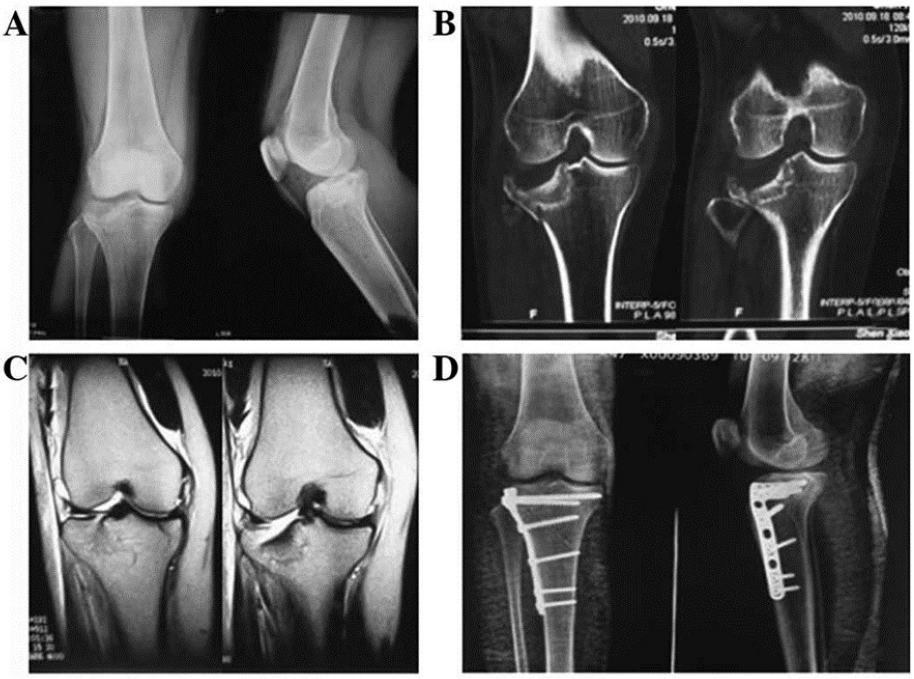
CT Scans

- A **computed tomography scan**, or CT scan, is similar to an MRI in that it produces detailed, high-quality images of the body.
- The CT scan is a more sophisticated and powerful X-ray that takes a 360-degree image of internal organs, the spine and vertebrae. Contrast dyes are often injected into the blood to make structures within the body more visible on the CT scan.
- A CT scan produces detailed images of organs, bones, soft tissue and blood vessels and can be used to more easily diagnose cancer, heart disease, appendicitis, musculoskeletal disorders, trauma and infectious diseases.
- A CT scanner looks like a large box with a tunnel in the center.
- The patient lies on a table that slides in and out of the tunnel, while the scanner rotates around the patient, producing cross-section images of the body.
- The technologist performing the scan sits in a separate room with computers on which the images are displayed.
- The technologist can speak with the patient using speakers and microphones.
- A CT scan is more expensive than an X-ray and is not always available at small or rural hospitals.

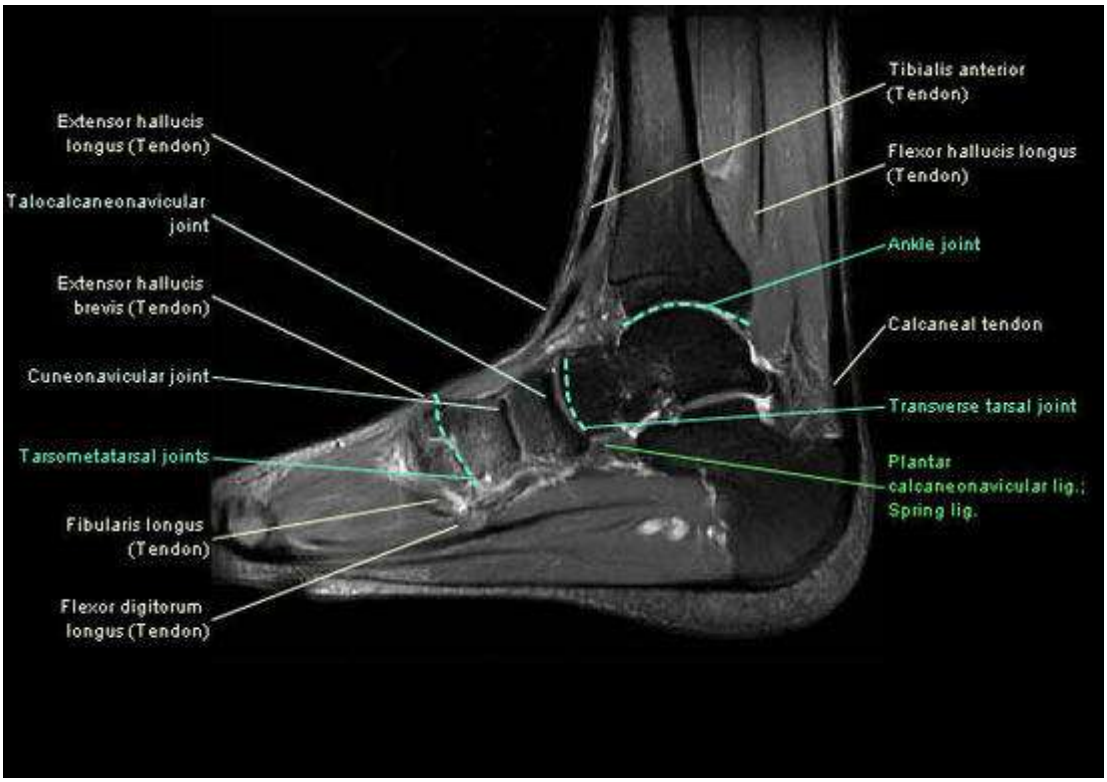
MRI

- **Magnetic resonance imaging**, or MRI, uses a powerful magnet and radio waves to create detailed, high-resolution cross-section images of bones and soft structures inside the body.
- MRI does not include radiation, as X-rays and CT scans do, and is generally used to diagnose bone and joint problems as well as torn ligaments and cartilage and herniated discs.
- MRI scans are best suited for looking at soft tissues such as ligaments and tendons, the brain, and many of the internal organs.
- MRI can provide exquisite detail of these structures and allows radiologists to diagnose a wide variety of disorders such as injuries to tendons and ligaments, strokes, and tumors

- During an MRI scan, the patient lies still on a table that slides into the tube-shaped MRI scanner. The machine then creates a magnetic field around the patient and pulses radio waves into the area of the body being pictured. The radio waves cause the tissues in the body to resonate. These vibrations are translated into detailed 2D images captured by a special computer program.
- Like an X-ray or CT scan, the MRI is painless, but the machine does produce a loud noise. Because the MRI uses large magnets, be sure to notify your doctor if you have metal clips, implants or other metal objects in the body.



(A) Preoperative X-ray.
(B) (CT) scan showing the lateral central collapse of the right tibial platform of ~2 cm.
(C) Preoperative (MRI) scan showing the lateral tibial plateau fracture and the complete disruption of the medial collateral ligment.
(D) Postoperative X-ray images showing the anatomical reduction of the right lateral tibial plateau fracture and the flat joint surface.



Labeled MRI of the Foot showing joints and tendons