

**College Guild**  
PO Box 6448 Brunswick, Maine 04011

# Health

## Unit 1 of 3

Welcome to the College Guild's course, Health!

**Overview:** this course is concerned with your body (bones, ligaments, muscles, circulatory, respiratory and nervous systems), plus exercising, techniques for relaxation, and information on pain and nutrition.

### Guidelines for all College Guild courses:

1. **Answer all the questions that are in bold print.** After we receive and review your completed Unit, we will send you feedback from your reader along with your original work and the next Unit. You don't need to return the questions -it saves us both postage.
2. There is no specific deadline to complete any Unit, but we would get concerned if we hadn't heard back from you after 2 months.
3. Remember how often the mail service loses things. **If you don't hear back from us after a month, please write to make sure we received your Unit** and sent out the next one.
4. Let us know if you need a **dictionary**, free to students who complete the first unit.

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### PART 1 - EXERCISE

Exercise is an activity which changes muscle action, joint movement, breathing and heart rate. But all our daily activities can do that -- walking across the room and lifting a spoon to our mouths requires muscle action; leaning over to tie a shoe requires joint stretching; watching a scary movie makes the heart rate increase; humidity alone can change the pattern of our breathing. Certainly, a man whose job requires loading heavy cartons into a truck eight hours/day is getting plenty of exercise. In this course, "exercise" will mean programs and activities which are undertaken to achieve a specific physical goal.

#### 1. If you were starting a new exercise program tomorrow, what would be your main goals?

People participate in sports to achieve specific physical goals too.

#### 2. What are three other reasons to participate in a sport?

Here are a variety of sports:

archery	baseball	basketball	weight lifting	swimming
basketball	football	hockey	track	shooting pool
golf	gymnastics	miniature golf	skiing	race car driving

#### 3. Of the activities listed above, pick the one that would be ideal for your program, whether or not it's possible to do at your prison. Explain all the reasons why.

There is another definition of exercise that does not have to do with physical activity. Former President Abraham Lincoln [1809-1865] wrote: *This country, with its institutions, belongs to the people who inhabit it. Whenever they shall grow weary of the existing government, they can exercise their Constitutional right of amending it.*

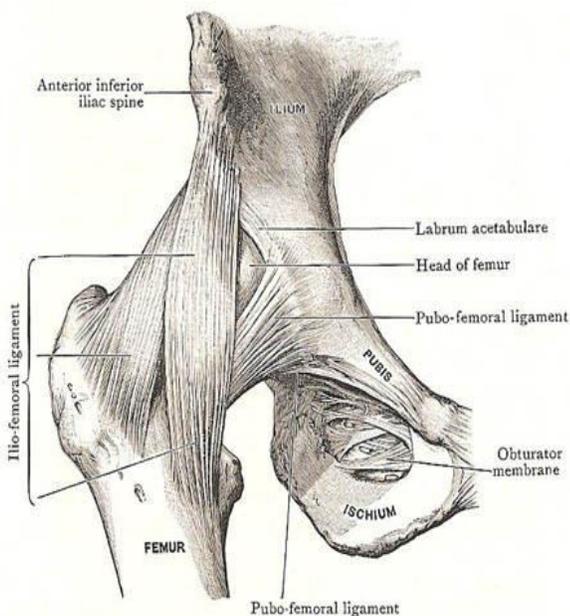
4. Write a sentence in which the word “exercise” appears twice, one for the physical and one the non-physical meaning.

Now it's time to exercise your imagination.

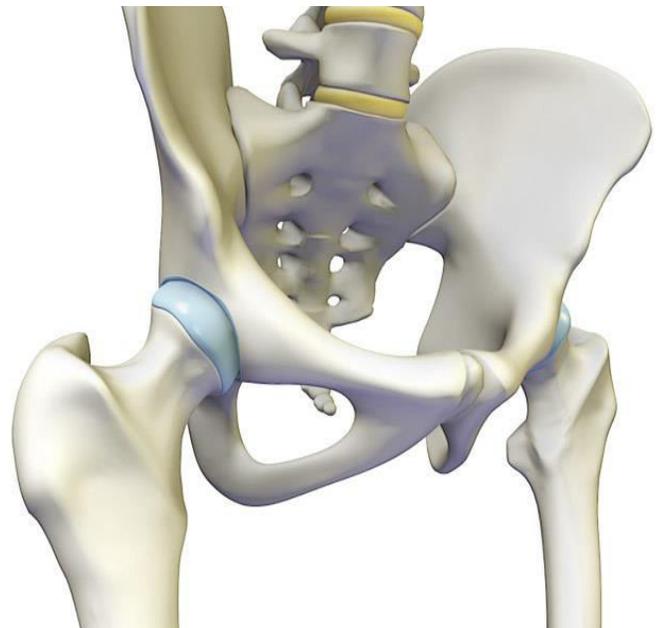
5. Make up an original sport or exercise for cave men.

## PART 2 – LIGAMENTS AND JOINTS

Look at page 7 and you'll see the framework from which the body moves. All these bones are "taped" together by ligaments. Where two bones connect are the joints, where movement occurs. Ligaments are non-stretchy, tough tissue (think of super-thick adhesive tape) that run from one bone to another at the joints. Below are two pictures of the hip joint, one with and one without ligaments. Notice how completely the ligaments surround the joint.



[http://www.daviddarling.info/images/hip\\_joint\\_front.jpg](http://www.daviddarling.info/images/hip_joint_front.jpg)



<https://bonesmart.org/wp-content/uploads/2010/10/anatomic-hip.jpg>

The hands are composed of many small bones compared to arms and legs. That means more joints and more ligaments. [To help both students and readers, the Appendix has feedback on questions with only one answer, but try them yourself first!]

6. Why do the hands need more joints than anywhere else?

7. Name one daily activity (not an exercise) you are doing when you move each of the following joints. Pick a different activity for each one. [Example: for "elbow" – tossing grain to a flock of chickens]

shoulder  
wrist

hip  
ankle

elbow  
fingers

knee  
toes

- 8. Pick any activity and describe what is happening to any 3 of the joints listed above when you perform that activity.** [Example: When I feed the chickens, my shoulder is flying forward as I hurl the chicken feed; my fingers are opening as I let go of the feed; my knees are staying straight because I'm standing in one place.]

Ligaments may be tough, but they can be stretched out. To imagine super-stretched out ligaments, think of a gymnast. For most of us, "flexibility" means having a normal amount of movement in the joints. Tight joints interfere with daily activities. Someone with severe arthritis, for example, may have stiff, bent fingers that cannot fully open.

- 9. Keeping your elbow bent as far as it will go, comb your hair. (No fair saying, "I'm bald" – pretend to comb your hair.) Now try it with your elbow locked in the straight position. How did you manage each one?**
- 10. Keeping your hips and knees bent, pick up something from the floor. Now try it with knees locked. Where did you feel the strain with each one?**
- 11. Think of a particular health problem that you or someone you know is dealing with. Pick an exercise or sport and explain how it could be adapted for maximum efficiency and enjoyment.**

When you exercise, it's important to be aware of the position of your joints to be able to adapt programs and to avoid injuries. For example, lifting a heavy object from the floor should not be done with straight knees using only the back muscles to lift.

- 12. Why would starting with bent knees protect the joints of your back?**

A joint sprain is a tear or sudden over-stretching of a ligament. The reason it hurts so much is because ligaments are full of pain receptors. With the function of ligaments in mind.....

- 13. What is another problem besides pain when there is a sprain?**

- 14. If you are on plenty of pain killers, can you walk on a sprained ankle without using crutches? Explain.**

Obviously, there is another type of injury that can affect the skeletal system and that is broken bones. Bones can snap and stay in position, or the two fragments can be displaced away from each other, or there can be a "hairline fracture" -- (imagine a plate with a small crack.)

We need to discuss sprains and fractures because people too often minimize these kinds of injuries. Complaining about pain is considered wimpy, and continuing to exercise or play with pain is considered macho. What really galls health professionals is TV commentators going on and on about how courageous some athlete is because she ignores the pain in her broken foot and continues to do triple flips off the balance beam! There should be a balance between being a brave competitor (or a macho prisoner) and common sense. Pain is a message your body sends to your brain to say – "Stop, I need to rest!"

- 15. Write a poem, essay or story about the sports world's and society's attitude about courage in the face of injury.**
- 16. How does the obsession with winning affect a participant's mental and physical health?**

### PART 3 - MUSCLES

Unlike ligaments, muscles are made up of tissue that "contracts" (tenses, shortens.) A muscle crosses a joint (where 2 bones come together.) Your brain sends messages down your spinal cord then out along a nerve which sends small

branches to the muscles. When the nerve endings "fire" (like an electrical impulse), they cause the fibers of the muscle to react and contract, pulling on the bones it is attached to, causing that joint to move.

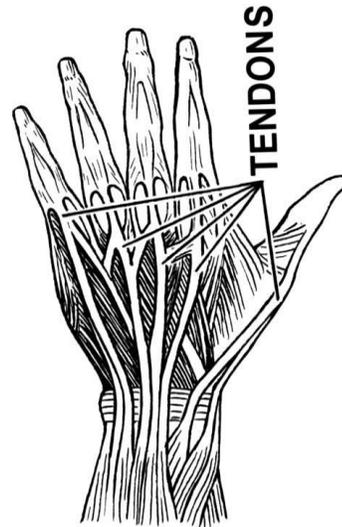
We've learned that a ligament stabilizes a joint and a muscle moves it -- one of them can do both.

**17. Can a muscle help stabilize a joint? Can a ligament help move it? Explain your answer.**

There is one part of many muscles that have a lot in common with ligaments -- "tendons" are thin bands that form the ends of muscles, attaching them to bones. The wrists and fingers provide a close-up look at tendons. Look at the back of your hand and spread your fingers apart. Below is also a drawing that shows what tendons look like under the skin.



<https://upload.wikimedia.org/wikipedia/commons/3/32/Human-Hands-Front-Back.jpg>



[https://commons.wikimedia.org/wiki/File:Tendon\\_\(PSF\).png](https://commons.wikimedia.org/wiki/File:Tendon_(PSF).png)

When a joint like the elbow, knee, fingers and wrists bend, it is called flexion. The opposite motion, straightening, is extension. Here is some practice with terminology.

**18. Describe what happens to your knee when you go from sitting to standing.**

**What would you be looking at if your neck is extended as far as it will go?**

**Describe the position of elbows and wrists during the beginning and end of a push-up.**

**What position is your wrist in when you are holding a tray full of glasses up over your head with one hand?**

It is no surprise that the heavier the weight a muscle can lift, the stronger it is, but there are a number of other factors to complicate exercise programs and measuring muscle strength:

- the number of repetitions
- the position of the joint or joints the muscle crosses
- whether an exercise is isometric (tightening without movement) or isotonic
- speed of movement
- whether a muscle is shortening, or lengthening slowly
- positioning relative to gravity

[More on these can be found in the Appendix for you serious exercisers.]

For example, an easy way to demonstrate the importance of speed is to try two ways of performing a sit-up (to strengthen the abdominal, or stomach, muscles). Lying on your back with knees flexed and feet on the floor, tighten your abdominals without moving. Then SLOWLY do a sit-up. Hold it when your body reaches the knees for a count of five, then SLOWLY lower yourself down. Then completely relax your abdominals and count to five. Repeat this three times. The more common and less effective way to strengthen the abdominals is to tighten the muscles and go up and down rapidly multiple times without relaxing the muscles in between each sit-up. Try three sit-ups that way.

**19. Describe the difference in how these two types of sit-ups felt.**

#### PART 4 - GRAVITY

Hold something in your hand that weighs about a pound or so. Slowly bend your elbow part way up (about 45 degrees). What you're doing is moving the object against gravity.

**20. Hold the weight up as long as you can. What do you feel and where?**

Muscles that contract against gravity have to work, especially if they are moving extra weight (holding a book for example). To get specific, we'll focus on the knee. The muscles that flex the knee are the hamstrings (a group of 3 muscles). The hamstrings compose the back of the thigh, running from pelvis to tibia (the large bone of the calf). In standing, when the hamstrings contract, they shorten, pulling on the tibia so the knee joint flexes, pulling the heel toward the butt.

The muscles that extend the knee are the quadriceps (a group of 4 muscles). The quadriceps is the big thigh muscle, running from pelvis to the front of the tibia. When it contracts, it extends the knee. The quadriceps end in a single big tendon; you can see it at the front of your knee and your knee cap (patella) sits right in it.

**21. When you are lying prone (on your stomach) and lifting a weight strapped to your ankle, which muscles would be moving the weight against gravity?**

Probably the most common exercise to strengthen the quadriceps is in sitting, extending the knee with a weight attached to the ankle. What happens if the leg is then SLOWLY lowered. Now the knee is bending and the muscle that bends the knee is the hamstrings – therefore the hamstrings are working, right? NO!

**22. Why not?**

The most common mistake in figuring out which muscles are working is to forget about the influence of gravity. A muscle that is fighting gravity is working, no matter what direction it's going in.

**23. Do a very slow deep knee bend, and pay attention to how your thigh muscles feel. When are your quads working? When are the hams working?**

**24. Don't do this, but imagine what would happen if you suddenly relaxed your quadriceps in the middle of a deep knee bend?**

Even though the knee is bending (a motion performed by the hamstrings), the hams don't have to work – gravity does it for them.

**25. When do the hamstrings work against gravity?**

## 26. If someone is weak and has trouble standing, which muscle group would need to be strengthened? Why?

The word STRENGTH can also mean something less visible than muscle bulk.

*We confide in our strength, without boasting of it; we respect that of others without fearing it.* (Thomas Jefferson, 1793)

*You gain strength, courage and confidence by every experience in which you really stop and look fear in the face.* (Anna Eleanor Roosevelt, 1960)

## 27. How can looking fear in the face make you stronger?

## 28. How would you define strength?

## APPENDIX

### MORE ON MUSCLES

#### Two-joint muscles

If a muscle crosses more than one joint, you have to think about the position of both of them before working on exercising a particular muscle. Here's a demonstration why: Make a really tight fist. Look at the position of your wrist. Here you are, strongly contracting the muscles that flex the fingers and the wrist. But your wrist is in extension. Here's another way to see the same thing.

Keep that hand fisted as tightly as you can while you flex your wrist as far as you can. The strength of your tight grip decreases. The answer is simply that there's a limit to how far the muscles doing the opposite movement can stretch.

#### Shortening vs. lengthening contractions

Imagine you are holding a weight in your hand and slowly flex the elbow and hold while you count five. Now SLOWLY extend your elbow, taking a full count of five to do it. Your biceps flexes and your triceps extends the elbow. When you extend, which muscle is being exercised? If you answered triceps, you're wrong! The reason is gravity and the key word here is SLOWLY. Why does extending a joint that is extended by the triceps strengthen the biceps? [Go back and review the section on quadriceps and hamstrings to make sure it's clear.]

#### Other planes of movement

The hip moves in 3 different planes. You already know about flexion/extension. When you flex your hip, you get a closer look at your knee. Extension pushes your leg backwards. Now try this: Stand with your feet pointing forward and hold on to something for balance. Keeping your body facing forward, lift one leg (knee fully extended) straight out to the side, keeping that foot pointing forward and not leaning your body to the opposite side.

How far does your leg "abduct" (move straight to the side)? Measure this by pretending your body is a clock; your feet are 6 o'clock, your head 12. What number is your abducted leg at? If you have full range of motion, your leg will be at 45 degrees, or about 7:30 on your clock for one leg – right or left? What time for the other side? The opposite of abduction is "adduction" where your leg moves back in. Look at the drawing on page 2 to see why your hip is limited in abduction.

Your hip also rotates. Sit down with your feet dangling. Keep your knee and hip in the same position while you pull your foot inward so you are looking at the inside of your shoe. That is "external rotation." The opposite is "internal rotation." Which one are your hips in when you sit on the ground with your legs crossed?

### Feedback for Unit 1 assignments

6) The hands need lots of joints because they perform so many intricate movements. They move the fingers, for example, to do everything from using chopsticks to cutting with scissors to playing a violin.

9-10) You can sort of comb your hair with elbow fully flexed, but you have to strain your neck to do it. It's impossible with the elbow locked in extension. Knees and hips bent: front of the thighs; knees straight: low back.

12) With knees straight, the small muscles of the spine are completely stretched out, then asked to lift a large weight with no help. The large muscles that straighten the knees can take much of the strain off the back.

13-14) The problems when there is a sprain are pain, instability and the risk that in the future, the joint will be more easily re-sprained. Because of the instability, support (such as using crutches) is necessary, whatever the pain level, for full healing to occur.

17) Muscles surround a joint; they can tense and provide support in addition to movement. Ligaments are not elastic; they surround a joint to support and stabilize it.

18) The knee starts in flexion and extends as you go from sitting to standing. In full neck extension, you should be looking at the sky or ceiling. You start a push-up with wrists extended and elbows flexed; as you push up, the elbows extend and the wrists stay extended. Your wrist is extended when you hold a tray over your head.

20) Your biceps is lifting the weight against gravity.

21) hamstrings

22) Even though the knee is bending, the quadriceps is still fighting gravity by controlling the movement.

23) quadriceps the whole time; hamstrings not at all

24) You would suddenly collapse.

25) lying "prone" (on your stomach)

26) the quadriceps



[https://cdn.pixabay.com/photo/2017/07/14/16/48/skeleton-2504341\\_960\\_720.jpg](https://cdn.pixabay.com/photo/2017/07/14/16/48/skeleton-2504341_960_720.jpg)

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*Remember: First names only & please let us know if your address changes*