
Team ACL Fellows Project

— Summer 40% —

Our Summer Goals

Brace Model Goals

- Research, research, research ★
- download Tinker Cat 3D modelling program ★
- Talk to Dr. King about prevention aspects of braces ★
- Look at previous models of braces ★
- Materials?
- 3D printing, cushioning, fabric ★
- Low profile, high profile? ★

Diet Program Goals

- Research & more research ★
- Determine foods best for directly after post-op ★
- Determine foods best for optimal muscle growth ★
- Contact nutritionist to validate research ★
- Make meals and explain nutritious importance for recovery

Stretching Guide Goals

- Research current stretching programs ★
- Research female anatomy ★
- Begin to assemble stretching program ★
- Work in conjunction with trainers and other professionals
- Begin to film stretching videos

Overall 40%

OUR MISSION...

Team ACL has a unique mission involving a three step prevention and recovery process tailored specifically for female athletes. The first step is a **STRETCHING PROGRAM** with educational and instructional videos to help strengthen the muscles usually concerned with ACL tears. The second step is to create a light weight, low profile **BRACE MODEL** designed to prevent women from tearing their ACL's. Finally, the third step, is to create a **DIET PLAN** for injured athletes that will promote healing.

- New pages on the website
 - ◆ Anatomy: overall knee, women vs. Men, tendons vs. ligaments, The ACL
 - ◆ Athlete stories: Compiled a list of questions to interview women/young girls
 - ◆ Nutrition: biology behind nutrition, key foods
- Research and More Research
 - ◆ All the information we found transferred onto our webpage
- Keeping Blogs updated
 - ◆ 2 or more posts every month

Brace 40%

Research:

- Research, research, research
 - Rehabilitative? Functional? Prophylactic?
 - Researched different brands of braces to see the perks and downsides of each to decide what brace should include
- Materials
 - 3D printing experience and research
 - PLA, ABS, PSL?
 - Foam, cushioning, padding?
 - Sizing, adjustable?
 - **Bluetooth**
 - This is something I am super excited about!! Maybe not in the most practical sense but to develop ideas and work with research involving it



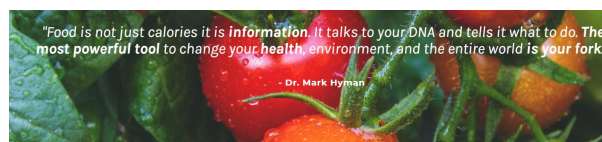
Blog Posts:

- Leadership lab
- Mentor posts
- Research updates
- Kylie's meeting with her PA about effectiveness of braces
- 3D printing update

Nutrition 40%

Goals completed:

- A lot of research
 - Created a separate page to fill with info from my research
- Determined foods best for directly after post-op & foods best for optimal muscle growth
 - Included all this on the nutrition page
 - And made sure to make a blog post for both
- I contacted my PA and a nutritionist
- **Make meals and explain nutritious importance for recovery changed**
 - I added other topic to the nutrition page
 - Some of the Titles are:
 - Why Nutrition?
 - Sugars, Proteins, Fats
 - Nutrients for Healing - their benefits
 - Want more muscle?



Nutrients for Healing

After a surgery a major surgery, in this instance an ACL surgery, your body is drained of your body's reserves. Ex. Antioxidants are a powerhouse of nutrition that helps the body repair damage. Fruits are full are Antioxidants!

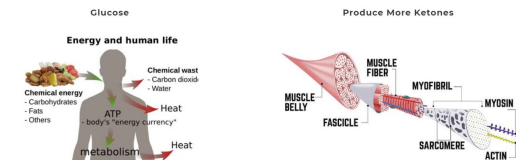
FOODS & THEIR BENEFITS

Carbs are important post-surgery! Veggies are a healthy source of carbs that battle fatigue and stop your muscles from breaking down. Another benefit from veggies is the amount of fiber which reduces constipation; a common side effect of pain meds and decreased mobility. Healthy Fats help the body absorb much needed vitamins from fruits and veggies. It is also essential for strengthening the immune system, decreasing risk of infection.

After surgery your body requires protein & iron since your muscles have been potentially damaged, moved and manipulated, an iron needs to repair. Amino Acids in proteins promote repair to damaged muscle. Also the iron will help replenish energy since iron aids in the creation of new blood cells.

Healthy fats after surgery provide the body with energy your brain requires & stops muscle from breaking down. Also provides another source of fiber.

Want more Muscle?



Glucose is what most of our food we consume end up since the body can only produce ATP (energy), when carbs are at the most basic level -- monosaccharides. Even proteins are broken down to the most basic level of macromolecules eventually so the body can produce energy.

This is why watching the amount of Carbs you consume is important since too much energy created by the body is turned into glycogen; meaning the extra energy is stored as fat.

When there isn't enough glucose consumed to provide the body energy, the stored energy is then used. The body will start to break down the fat and use the glucose from the triglycerides. Ketones are the byproduct of this process. Ketones are acids that indicate the breakdown of fats. For athletes minimizing the amount of stored fat is an important step to start producing muscle and becoming stronger. Sticking with a low carb diet and incorporating more proteins & healthy fats is important for athletes trying to become stronger. Which is very important for ACL recovery and prevention of ACL tears.

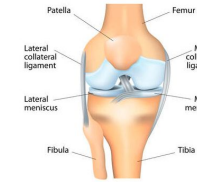
Blog posts:

- Leadership lab
- Mentor meetings
- Research updates

Stretching 40%

- Goals Completed:
 - Dove into research in the early summer
 - Began with researching stretching
 - Quickly realized learning anatomy was very important
 - Needed a strong background in the physical element to understand the stretches
 - First learned basic anatomy, moved to research specifically on women
 - Found some conflicting information
 - Began compiling a large list of stretching
 - https://docs.google.com/document/d/1iViRp_mjzleoy3E0R6he11_SEtypmjoz-C7FOYYdErFE/edit
 - New project – began to reach out to athletes regarding their experience

THE HUMAN KNEE



INTRODUCTION TO THE KNEE

The knee is the largest joint in the body, and with that, the knee is also one of the most complex. There are several different parts of the knee which allow it to have a range of movement. This allows humans to perform many different tasks, such as walking, jumping, and running. As it is very complex, the knee is also more susceptible to injury than other parts of the body. MedicalNewsToday even says, "The knee is the most commonly injured joint by adolescent athletes with an estimated 2.5 million sports-related injuries yearly". Understanding the basic knee anatomy makes it much easier to comprehend the gravity of knee injuries for athletes, and further, why females are more susceptible to injury than males.

ANATOMY

Most basically, the knee connects the femur (thigh bone) to the tibia (shin bone), and is protected by the patella (knee cap). The knee is a joint, which means it is a point where two bones meet. More specifically, the knee is a **synovial joint**. A synovial joint is a joint cavity filled with fluid, which provides a wide range of motion to the knee, and also keeps the joint lubricated. There are two different types of cartilage in the knee. Cartilage is a connective tissue in the body, that is tough but flexible. The two types of cartilage in the knee are the meniscus and the articular cartilage. The meniscus consists of two semicircle pieces of

rubbery cartilage that are located on the inner (medial) and outer (lateral) sides of the knee. The meniscus helps to cushion the knee, and protect the bones from rubbing against each other, and also to improve balance and stability. The other type of cartilage in the knee is called articular cartilage. Articular cartilage is a thin, white, slippery cartilage that is found on the end of bones – on the femur, the top of the tibia, and the back of the patella. Articular cartilage is a very important part of the knee structure because it allows the bones to move across each other, as well as serves as a shock absorber. Another pivotal part of the knee anatomy are the ligaments. The ligaments connect the bones to one another. There are four ligaments in the knee, two that are collateral (on the sides of knee) and two that are cruciate (on center of knee):

Major Ligaments of the Knee



- Anterior cruciate ligament (ACL) - located in the front of the knee, prevents femur and tibia from sliding into one another
 - Posterior cruciate ligament (PCL) - located in the back of the knee, also prevents femur and tibia from sliding into one another
 - Medial collateral ligament (MCL) - located on the inside of the knee joint, prevents the femur from moving side to side
 - Lateral collateral ligament (LCL) - located on the outside of the joint, also prevents side-to-side movement of the femur
- The ligaments are a very vital part of the structure of the knee, and help aid in movement as well as stability. However, they are one of the most injured parts of the knee, as will be discussed.

The tendons in the knee are also an important part in maintaining its function. The two main tendons in the knee are the patellar tendon and the quadriceps tendon. These work to attach muscles to the knee joint. These said muscles are the quadriceps, hamstrings, and gluteal muscles. All provide strength to the knee, as well as allow movement.

Blog posts:

- Leadership Lab
- Mentor Meeting
- Detailing Research

Challenges

- Asking the right questions when researching
- Not getting side tracked with new aspects of the project
- Trainers/athletes not being accessible for interviews
- Severn (and many other athletic fields) were not open over the summer in order for us to film stretching videos
 - ◆ Restrictions due to Covid
- Working together while apart

New Developments!

- Athlete's story page
- Interview questions
- Began reaching out to athletes to schedule interview times

Questions for Interviews

1. What sports do you play and when did you start playing?
2. Have you had past injuries?
 - a. If there are ankle or hip related this means they were prone to their knee injury
3. How did you tear your ACL ?
4. Are you still in the recovery process? If so, what stage are you in?
5. Have you had multiple knee injuries?
 - a. If so their recovery process most likely was not effective
6. Describe your emotions throughout the recovery process.
7. What was your outlook toward the injury in the beginning and how did it change toward the end of your recovery process?
8. What is one value or characteristic you gained looking back on the entirety of the process?
9. What is one word you would use to describe your personal knee journey?
10. If you could give one piece of advice to other sidelined athletes, what would it be?

Looking Forward

- Making canva of different kinds of food & their contributions to the body
- Hopefully working with the new 3D printers and other resources in the GIC
- Filming the stretching videos
- Reach out to professionals to critique our work
- Keeping in contact with mentors outside of school
- Keeping website updated
- Interviewing women – ACL stories