

In America, 25,000 ankle sprains happen every day; 9 million every year. Ankles are the second most commonly injured joint and account for 20% of all reported sport injuries.

Sustaining multiple ankle injuries can lead to a condition called Chronic Ankle Instability or CAI. When someone has CAI, not only are the ankles affected, but spending months and years compensating causes other lower body weaknesses to form. One example would be how limping can cause your posture to change, weakening one side of your hips.

There are 2 ways to treat CAI, both of which require treating the ankle and the other affected muscles. The first way is the best: identifying which lower body muscles have been weakened and treating them individually. Unfortunately, it is extremely expensive and difficult to identify those weaknesses. This leads to the second treatment method: a one size fits all physical therapy program. Its general, its inefficient, it takes a long time, and sadly it's the most common form of treatment for CAI.

My research is about exploring a group based approach, where we group people together that have similar sets of muscle weaknesses and then give them treatments oriented towards those group similarities.

How can we do this? We decided to group subjects using movement curves. These charts are a few examples of the 100+ curves we collected from subjects. They show how the angle of a joint changes as a person performs an action like lunging. This gives us a sense of how that person compensates under physical stress. We chose to use these for grouping because it makes sense that similar movement curve shapes correspond to similar muscle weaknesses.

By using a few statistical procedures, we have discovered that there are indeed a handful of distinct overall curve shapes, about 5 or 6. This is monumental! The small number of shapes means that group based treatment is feasible. With this, we can start pinpointing group muscle weaknesses and begin designing more customized treatment plans. In the end, the ability to group by movement curves will not only improve CAI treatment, but could enhance many other physical therapy programs by making them somewhat tailored to the individual who needs it. Thank you.