



SWINGING FOR THE INTEGRATED NETS:

THE VALKYRIE-POWERED LAB THAT'S BLURRING THE BOUNDARY BETWEEN SPORTS SCIENCE AND CLINICAL BIOMECHANICS



Blesson Varghese, B.V.Crafted Photography LLC

In late 2023, Houston Methodist Hospital and Rice University launched a unique new venture—the Center for Human Performance, a space for the study and advancement of exercise physiology, injury prevention and rehabilitation of both student athletes and general population subjects.



Jordan Ankersen
Clinical Research Engineer at Houston Methodist

The 6000-square-foot facility combines a state-of-the-art system of Vicon's Valkyrie cameras with force-plate measurement, region-by-region quantification of bone density, metabolic analysis, cardiovascular screening and aerobic performance testing.

"For a hospital research department, we are very fortunate not only to have the system that we have, but also the space," says Jordan Ankersen, a clinical research engineer and recent PhD graduate in Biomedical Engineering. "Not only do we have motion capture and its affiliated technology, we've got a Biodex, we've got metabolic carts with treadmills and bicycles, we've got a DEXA scanner that we can use to assess body composition, and we have a wet lab space, giving us blood and tissue sampling capabilities."

SWINGING FOR THE NETS

A key focus for the Center so far has been baseball. "I could probably count on one hand the number of groups who have done marker-based hitting motion capture, because it's so difficult," says Ankersen.



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As she puts it: “If a baseball can go in a given direction, it’s going to. If it can’t, it’s still going to.” But because the Center’s designers knew it would be capturing baseball from the start, they were able to accommodate the sport.

“We have integrated nets installed in the lab,” says Ankersen. “That’s something that’s really unique. We went ahead and extended our raised flooring for the force platforms down the full-length pitching lane. So, not only do we have a full-length pitching or hitting lane, but we can also have somebody run or jump, and we could use it when working with ballet dancers.”

The work they’ve done has paid off. “The data set that we’ve collected is, as far as I know, one of the biggest in the field,” says Ankersen.

CROSSING FIELDS

Unusually, the Center’s remit is a roughly even split between sports and clinical work. “On the surface, what we’re doing with baseball and with our total knee and total hip replacement patients does seem really different,” says Ankersen.

But as far as she’s concerned, that crossover is one of the Center’s strengths. “It’s honestly rooted in a lot of the same questions and the same goals. Firstly, what is the immediate clinical application for this?”

“But the other thing that we really are passionate about and that I’m really trying to push forward, is that our

doctors want the same information as we’re generating for our athletes. They would cry tears of joy if they could send every patient they have to me and I could give them an immediate report with that depth of data.

All Vicon customers have access to support engineers who offer tools and advice to all of our customers, so they can easily customize the technology to their needs.

“The more code I write, the more we automate things, the better I get at it. And the more we share knowledge and automate our system, the better we’re going to get at providing that extra level of data to clinicians.”

BETTER REPORTING, BETTER OUTCOMES

Something that will help across both populations is Nexus Insight, Vicon’s new life sciences reporting tool, which the Center plans to adopt.

“Reporting that’s user-friendly to non-biomechanists is great, because that’s one of the things that we really would like to be able to do, whether it’s for a physician, a patient, or an athlete and their trainer.”

She gives the example of the baseball players she works with. “My baseball players don’t give a hoot that they had 45° of external rotation, but the other player had 39°. What they need to know is they’re getting lazy on their arm-cocking phase, so they need to put more power in that way, or whatever it may be.

SHARING PRACTICAL KNOWLEDGE

Ankersen is passionate about the knowledge-sharing piece, too. She turns back to her work with baseball players as an example. “We’re going to have to adapt or write new code for the baseball player who has a crazy arm when he’s winding up to throw his baseball. I can’t use an algorithm for that, I’m going to have to write custom code.

“But if somebody has written custom code for something else and gotten me 95% of the way there, fantastic.

“Or there’s going to be that one kid that markers don’t stick to. And it took me three years before I found the stickies and the skin tack and then figured out how to incorporate a fan in there to speed up the process.”

That’s the sort of information that’s unlikely to find its way into papers, but that Ankersen hopes to see shared more widely in the future.

DIVERSE VOICES

Another thing that Ankersen believes could add value to the world of motion capture is a greater diversity of users. “I’m in a wheelchair,” she explains. When she started out in the world of motion capture, though, she still had use of both her legs. “It would be so hard to break into the field in my current physical condition,” she says.



And yet, she argues, her physical condition offers clear advantages to her work. “One of the unique opportunities that I have is to be involved in healthcare as a researcher. I get to see it from the patient’s perspective and the researcher’s perspective, and consider how I want this data to be used to make a surgical decision in my case, or in the cases of my friends who have similar experiences to me. And so I think that keeping the users of the technology in mind, keeping in mind the people who aren’t yet users but would be really good users of motion capture, is really important.

“Keeping patients or athletes or whoever it is in mind, keeping that macro perspective about who we can really impact and what voices are important to hear, is essential.”

WILL THE FUTURE BE MARKERLESS?

Vicon is currently working on a markerless tracking technology that will prioritize real-time integration.

Ankersen sees potential for markerless tracking in the Center’s future.. “I think it’s important to have an open mind about these things and to acknowledge that markerless may be a part of our future. But even if markerless technology is awesome, I don’t think we’ll ever not need these optical, marker-based systems in the life sciences world,” she says.

It could be that markerless falls into the bracket of technologies that the Center for Human Performance uses its Vicon system to validate.

“We have a pretty large system, especially from a life sciences perspective. We’re trying to take advantage of that, using motion capture capabilities in conjunction with other technologies so that we can validate them for these and other applications.”

For more on the work of Jordan Ankersen see our feature on her lessons from studying sheep in the Texas summer on P___. For more on the Center for Human Performance, visit: <https://chp.rice.edu/>



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