Modernizing Cal Poly’s Human Motion Biomechanics Lab

Charting a Path for the Future

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Abstract

The Kinesiology Department of California Polytechnic State University, San Luis Obispo currently has a very outdated Human Biomechanics Lab. This lab may be good for students to gain at least some experience with human biomechanics, but it does not have the ability to be used for faculty research. Cal Poly needs a new Human Motion Biomechanics Research Lab where faculty can hold ongoing research in human biomechanics. Many universities across the country have established this kind of lab and, unfortunately without something comparable, Cal Poly is starting to fall behind the times. This lab will benefit our faculty, students, and hopefully the community who will be able to receive services from this lab. Research could be done on knee injuries, elite athlete performance, and other human biomechanical issues that would potentially provide wonderful services to our community. In order for this lab to become a reality we will need to find the space to house the facility and adequate funding. This is a project that has the potential to help many people and the more support we get, the closer we get to having this lab up and running.

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"Learn by doing". These words are the essence of California Polytechnic State University, San Luis Obispo. In this day and age, where budget cuts and federal as well as state deficits are a very real problem, this is a phrase that needs to be taken into consideration when deciding what facilities are going to get funded, and which will be placed back on the shelf. Many universities in the United States are at the cutting edge of technology and research in the health and medical fields, and the reason they got there is because someone believed it was worth the time and money. Stanford University is well known for its research in health and human performance, with multiple facilities focusing heavily on biomechanics and human movement as it pertains to injury, disability and even sports performance.

At Cal Poly, there is a movement gaining momentum in the Kinesiology Department, as well as the Mechanical Engineering Department to develop a human performance lab on campus, primarily for faculty to conduct research with the goal of publication. Faculty from both departments are pushing for this lab, because as of now, no such facility exists on the Cal Poly campus.
Not only would a facility like this benefit faculty, but will also work within the local community in an effort to analyze elite athletes in a controlled setting, as well as adding an opportunity to educate the community on good nutrition practices as an attempt to combat the growing obesity epidemic. This will be primarily led by the faculty of various departments, but will also give students an opportunity to help out during the summer, as well as during spring and winter breaks. This is "learn by doing" at its core.

The issues facing the development of this program are all too familiar; there are too many projects and too little space, money, resources and equipment. Gaining financial support from the private sector, as well as NIH (National Institute of Health) Grants, are the primary sources for funding a project of this magnitude. But it must be demonstrated that the project is worthwhile. Laying out the costs and benefits of a facility like this will hopefully shed some light on the value of a Human Performance Lab at Cal Poly, not only for the University, but also for the community and likely to other areas of the country.
History

Cal Poly currently has a Human Motion Biomechanics Lab, but it is outdated and does not allow for research opportunities. This new lab would have a greater emphasis on faculty-led research that would produce quantifiable results regarding human biomechanics. Student involvement would of course still be valued as part of Cal Poly’s “Learn By Doing” philosophy. Students that are interested in human biomechanics in both the Kinesiology and Mechanical Engineering departments would get the opportunity to get involved with faculty-led research projects. The Biomechanics lab located in the Kinesiology department focuses on student instruction but it does not allow for any substantial faculty research. An updated Human Performance Lab would foster new experiences based on up-to-date faculty research that will not only benefit scholarship and community engagement, but allow students to enhance their learning and professional preparation through collaboration with Cal Poly faculty.

Part of Cal Poly's current lab
Many universities across the country have some type of Human Performance lab. UC Davis has one that studies the effect of physical activity on preventing chronic health problems. This facility houses equipment such as a Hitachi dual-Probe Ultrasound System that can “non invasively quantify muscle-tendon behavior and muscle flow” (ucdavis.edu, 2014).

Stanford University has one that focuses on preventing injury during sport and exercise. Up to date equipment in this lab include a “iDXA scanner for body composition and bone mineral density measures, a VICON 8-camera three dimensional Motion Capture System, and Holter Monitors that can measure cardiac function for up to 48 hours” (stanford.edu, 2014). Creating a similar Human Motion lab that focused on knee injury, elite athlete performance, and other human biomechanical related topics would allow our faculty and students the same cutting edge research opportunities as these universities.
Universities that have already created some type of Human Motion Biomechanics Lab have seen the benefits that can come from it. Health will continue to be a huge part of our society and efforts to promote health and prevent injury should be continued. With this lab, Cal Poly has the opportunity to potentially improve the health of the community. Like other labs across the country, the Cal Poly Human Motion Biomechanics Lab would not only benefit the community members receiving the services, but also the faculty members who would use the lab’s resources to conduct their research by using the state of the art equipment, and of course the students will potentially get to collaborate on the research conducted by faculty.

Cal Poly’s new lab could look like these!
Throughout human history, research has contributed to a large amount of our progress as a species. As our ability to conduct research has evolved, so has the technology necessary to carry out experiments. These two elements have merged in a way that has rendered them somewhat inseparable, where one cannot fully function without the other. Looking at prestigious research schools like Stanford University, it is apparent that there is little shortage in technology as well as an abundance of research being conducted in their various facilities, resulting in breakthrough treatments in the health and medical field as well as an extensive catalog of publications in many nationally and internationally recognized academic journals. The type of facility that produces research of this caliber, at places like Stanford, Penn State and East Carolina University tends to have a strong relation to, or focus on, biomechanics and human performance. It is research facilities like these that enable researchers, as well as students to ask as well as answer questions in their areas of interest or expertise.

Human performance laboratories not only cultivate extensive research and exploration within the walls of the university, but also actually spill over into the local community and also at the national level. Dr. Taylor, the Chair of the Kinesiology Department at California Polytechnic University spoke very highly of the benefits that a human performance lab could have on the community: “I think one of the biggest potential beneficiaries of this lab is going to be our local community. Because the kind of data that they are going to collect in this human movement facility is going to be profoundly beneficial to elite athletes. So, with this lab in place we could engage in some fee for service work, because there are a lot of elite athletes that live in this area, or come to the Central Coast to train” (Taylor, 2014).
Dr. Taylor also spoke about other potential community benefits, such as a focus on nutrition and obesity not just in research but in treatment options as well. He explained that the Nutrition Department, as well as the Kinesiology Department have multiple programs that either aid populations within the community in weight loss and healthy eating habits, or are conducting research on the topic.

Yet another driving force behind human performance research facilities is the collaboration of minds from all over the world. If the facility houses the equipment and technology necessary to perform research, it is likely that other brilliant minds will travel to the lab to conduct research and work with on-site faculty as well. With current research being performed on campus, and published in academic journals, it is a safe assumption that it will bring positive attention to the university. With a facility producing research of the caliber that is expected, there is a greater likelihood of private sector funding for future research. When speaking of the private sector, this includes local athletes, businesses, health facilities that include nutritionists and M.D.'s and even programs working with wounded veterans.

There are many potential opportunities, not only for investors, but also for a number of groups within the academic community and the local community as a whole. A Human Performance Laboratory at Cal Poly can be an excellent use of the limited real estate available at Cal Poly, where the benefits can reach far beyond the Kinesiology and Mechanical Engineering Departments.
The main opposition to this project is funding. In the 2009-2010 school year, over one billion dollars of funding was cut from the California State University (CSU) system, the University of California (UC) system, and California Community Colleges (Newell, 2009). The budget cuts have a detrimental effect on these public institutions, including but not limited to: decreasing access to underrepresented populations, decreasing the quality of education, increasing the time to degree completion, increasing student debt, and decreasing research propensity. With these deficits in the university system funding, any sort of money that a school has should be going toward replacing the jobs, and increasing the number of classes in order to reduce overcrowding in these public institutions. A research facility of any type should be a secondary goal once the primary necessities have been met.

Funding is also a problem at a university like Cal Poly because faculty members across campus want any money to be allocated to their research. Every department believes they are the most deserving. Fortunately though, Dr. Kevin Taylor explained that faculty members outside of the Kinesiology and Mechanical Engineering departments are also excited about this lab. Professors from Biomedical Engineering, Nutrition, and even the Statistics departments think this
According to Dr. Kevin Taylor, the new lab would be able to offer testing to elite athletes as well as members of the community and charge them based on the type of testing (Taylor, 2014). This will give students valuable opportunities to do hands-on testing, as well as provide the faculty with an up-to-date facility to do research.

Dr. Taylor also mentioned that in order for this project to move forward, securing a space to house this project might be difficult. Since this lab would be on campus, where is there adequate space for the entire lab? There are not many spaces on campus that could house such an undertaking and building a new facility seems out of the question for the monetary reasons previously mentioned. If Cal Poly can secure the funding, we would need a definitive space to establish this lab (Taylor, 2014).

Since there is such a large budget deficit in the state, Cal Poly faculty are desperate to secure funding for research projects that they have in mind. Those trying to secure funding for their own project would be opposed to the Human Motion Biomechanics Lab, because funding may not go toward their project. According to Dr. Taylor, whoever has the best proposal for their project is most likely to secure funding. Only the best projects will be selected, and if this project were not initially passed, the next step would be to refocus the proposal to make it stronger and more inviting for potential investors (Taylor, 2014). Cal Poly would need to pursue funding from the private sector, specifically from companies who are interested in the field of biomechanics, as they are more likely to fund Cal Poly than unrelated companies.

lab is a great idea. Hopefully as the project gains more support the proper funding will be given to the creation of this lab.

Although there is a budget deficit, bringing in a facility used for research purposes could potentially become a future source of income for the university.
Ancillary Problems

Some secondary problems to the Human Motion Biomechanics Lab include who exactly will be the primary users of this lab. Cal Poly’s motto of “learn by doing” suggests that all students should have a hands-on experience as much as possible. However, as suggested by Dr. Taylor if this particular lab is made a reality, the equipment will likely mainly be used for research by faculty. Though this research is a great opportunity for students to learn about biomechanics, it is less interactive for them. The equipment needed for this lab must be perfectly calibrated and cannot really be touched or moved by anyone. Obviously students are not expert researchers so there is a question of if students would even be allowed to use the equipment. However, the ability to observe how the equipment is used and eventually get hand-on experience with the equipment will arm students with useful skills that they may use in future research both at Cal Poly and in their future careers.

Example of Kinesiology faculty and students gaining hands on experience
Solutions to this issue may include allocating outdated equipment to students while the new equipment could be used solely for research done by the faculty at Cal Poly as well as outside researchers. This way students are able to have the hands-on experience that they desire and the researchers are able to get the best possible results. Dr. Taylor suggested that students could potentially be aids in the research lab to get a greater experience. So, a larger number of students would be able to utilize the older lab equipment and a select few students could learn to use the new equipment. It is even possible that this solution could open up jobs to students within both the kinesiology and engineering department.

As stated before, necessary space is essential for the Human Motion Biomechanics Lab and finding that space is proving to be difficult. The kinesiology department is fighting for rights to use Crandall Gym. Originally Crandall Gym had the fate of being destroyed due to its unreliable structure that may not withstand earthquakes. However, now the CSU system is willing to fund the renovation of the building to make it safe.

But if this were to occur, who would decide what its purpose would be? It may be difficult to argue that the Human Motion Biomechanics Lab deserves to be in the gym considering other people want to use the space. According to Dr. Taylor, this lab needs cameras mounted on the wall in a virtually dustless and temperature controlled space. Many may question whether Crandall Gym is a viable space for the Human Motion Biomechanics lab even with its improvements. Will the gym be so state of the art that it will be temperature controlled and virtually dustless? There is also an issue of people walking in and out of Crandall Gym that may disturb the equipment of the lab, as sometimes students use it as a shortcut on their walk home. It is easy enough to lock up the building after every use, but imagine if
somebody forgot to lock it and the equipment or data for research was ruined and deemed useless.

Use of Crandall Gym for the Human Motion Biomechanics Lab could actually be very beneficial to all people involved. Using this space eliminates the need to build a new space for the lab, therefore decreasing costs. As many people are aware, the kinesiology tower gets a great amount of use from students doing labs. Adding yet another element, i.e. the HMB Lab, would create an even more crowded environment. By using Crandall Gym, the space available in the kinesiology tower on the first and second floors would not be disrupted.
The Human Motion Biomechanics Lab will give students a greater opportunity to continue to “learn by doing,” which is the basis of what Cal Poly is founded on. Cal Poly faculty and staff will be able to pursue the research projects they have been unable to carry out due to insufficient facilities and resources. The lab will give Cal Poly students an opportunity to gain relevant research experience and will give the surrounding community great opportunity to have exercise testing in a reliable, up to date facility. Other universities have existing facilities, which far surpass the quality of Cal Poly’s current facility. Without a new facility, we risk falling behind the curve potentially putting Cal Poly students at a disadvantage in the job market. Cal Poly has some of the greatest minds in public education, as evidenced through the various faculty members who have secured multi-million dollar grants to support research projects. They need the facility to keep striving for greatness and breaking ground in the field of kinesiology. The funding of this facility would provide great opportunity in biomechanics research. To not fund it would be an enormous loss and an injustice to the Cal Poly and surrounding San Luis Obispo County communities.

Learn by doing. Theory is nice, but nothing replaces actual experience.
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