

The Science of Surfing

Newcomer and Nessler, both lifelong surfers who grew up in North San Diego County, first teamed up and began delving into the science of surfing several years ago.

“We initially sought to characterize activity and cardiovascular responses of recreational surfers during normal surfing sessions,” said Newcomer. “Specifically we were interested in the cardiovascular health benefits of participating in surfing and how the aging process impacted the cardiovascular system and performance in the water.”

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For their initial studies, subjects were strapped with heart rate monitors, and a team of undergraduates monitored heart rate response to paddling and riding waves while also capturing the surfers’ moves on camera. The goal was to discover if a session in the water had the same exercise benefits as a session in the gym. In fact, they proved that paddling out is indeed a viable form of aerobic exercise.

Newcomer and Nessler then moved their research into a CSUSM kinesiology laboratory for more controlled experiments that examined, for example, balance, postural sway and lower extremity strength.

“And now we have transitioned our research endeavors to a flume where we are able to control water speed and temperature very precisely. This allows us to perform experiments in a very controlled

environment which we have previously been unable to do during our field studies,” explained Newcomer. The flume, a 9-by-16-foot pool with a variable current, allows research participants to paddle in place at controlled speeds.

In this environment Newcomer and Nessler are now examining how the design, materials and construction of surf equipment and products, such as boards, wetsuits and vests, impact the human body and athletic performance with regard to paddling efficiency, oxygen uptake, heart rate, thermoregulation, muscle activity and mechanics.

“We are looking at how products made by the surf industry perform in different situations,” said Newcomer. “For instance, wetsuits have been historically manufactured with the sole purpose of insulating a surfer from cold water exposure, but it is important to remember that the insulating qualities of wetsuits come at a cost to paddling efficiency and wave riding performance. Therefore finding the balance between warmth and flexibility is a very important research question that we are trying to answer. In addition, we are working with surfboard manufacturers to better understand the relationship between surfboard paddling efficiency and maneuverability while wave riding.”

And the surf industry is taking note. Newcomer and Nessler began collaborating with surf industry giants Hurley and Firewire to test products, along with other smaller industry collaborators such as Todd McFarland Surfboards.

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Students Get Stoked on Research

Nessler and Newcomer are not only passionate about their work, but about bringing curriculum to life for their undergraduate students who work alongside them in the lab and field. They have incorporated research into the undergraduate curriculum with students responsible for all aspects of research protocol.

“One of the most unique things about what we are doing here is that undergraduates are getting to apply what they are learning in class to testing products for a number of action sport industry leaders,” explained Newcomer. “This is a win-win situation since we are able to keep costs down for our industry collaborators while engaging our students in this innovative curriculum. We have also observed students are more engaged in these classes since implementing these real life studies in our curriculum. This engagement likely is a result of the students connecting with these projects and buying into the pedagogical paradigm. Equally as important is the connection the students have with products they are testing and the companies they are testing them for.”

Jean Aguilar, a senior kinesiology major, is among the students collecting and analyzing data. Jean plans to apply to medical school but credits her mentor, Dr. Newcomer, with providing her with the chance to do research typically reserved at other universities for graduate-level students. This summer, she will co-author a paper on wetsuit design.

“Working on the surf study has been an invaluable experience,” she reflected. “Working with the latest technology, amazing collaborators and surf subjects pushed me out of my comfort zone and helped me grow to be a better student.”

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On the Horizon: A Future CSUSM Action Sports Institute

Ideally situated in North San Diego County in the center of the booming surf and action sports industry, Newcomer and Nessler see Cal State San Marcos as the perfect location for a possible future Action Sports Institute.

“We see the Institute addressing board sports such as skateboarding and stand-up paddle boarding, as well as snow sports such as snowboarding,” said Nessler. “If we could grow an institute like this, we could do more research, be more productive, train more students and help more companies in our backyard.”

In fact, the professors are currently studying the health benefits of skateboarding in youth—data that will contribute to an overall understanding of how the sport positively affects weight management and cardiovascular health.

“There are other applications to this—not just surfing or action sports. We could learn some things about rehabilitation or learn some things about technology that could be used in other research studies or environments,” said Nessler. “While the story of surfing is cool and we enjoy what we are doing, there are ultimately farther reaching implications.”



▶ Watch CSUSM students and faculty in action as they perform cutting edge action sports research.

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