ADVENTURE PURSUITS: AN AXIS FOR BIOMECHANICS, TECHNIQUE AND TECHNOLOGY

Mark Jones[1]

Sport Performance Research Institute New Zealand, AUT University, Auckland, New Zealand[1]

Adventure pursuits and biomechanics are two fields that have broad areas of overlap and much to offer each other in the way of opportunities created through research. This invited paper will outline experiences of kayaking the length of the Antarctic Peninsula and some of the technological innovations developed. Examples of adventure pursuits questions that have been addressed by research projects will be outlined.

KEY WORDS: Eskimo roll, rope strain, pogies, white-water rescue technique.

My early associations with outdoor places and outdoors people led to some exceptional friendship bonds and rich experiences. Two people I used to work with at a New Zealand outdoor centre back in the 90's were Graham Charles and Marcus Waters. We were inspired by a number of Kiwis who had left the shores of New Zealand to write a chapter in the annuls of adventure in less populated latitudes. Antarctica, being on our in New Zealand was the obvious choice and we set about getting sponsored to go there. That required originality. Since Borg Oustland had already dragged a sled solo across the Antarctic continent, we figured sled hauling's pinnacle had pretty much been reached in Antarctica. At that time there wasn't a road to the pole so biking there didn't cross our minds. It was sea kayaking where we felt we could add something to adventure history, and therefore interest sponsors in helping pay our way down there. It was never going to be that simple of course. Otherwise it would have already been done. Or it was completely stupid to attempt. When you set out to do the undone you are never sure which it is. People judge which it was on the results of your venture.

The biggest thing we could conceive of was to kayak the length of the Antarctic Peninsula. This ended up being a three-month undertaking. We flew to South America, and not without mishap managed to land our three kayaks and 17 boxes of food and equipment in the southernmost Argentinean town of Ushuaia. We crossed the Drake Passage aboard Sir Peter Blake's Sea Master and spent the next 35 days in our kayaks unsupported by a vessel and alone sea kayaking along the coast of "The Last Great Wilderness". Our success led to a number of other world first expeditions in the Polar regions, the establishment of Adventure Philosophy, and the Adventure Philosophy Charitable Trust.

We believe in the importance of adventure in New Zealand and international culture. As a small island nation a pioneering spirit, boldness to think outside the square and willingness to take calculated risks are the 'survival' capabilities needed for people to thrive. We have a rich adventure heritage in New Zealand. We want to see that continue.

Research shares much in common with adventure journeys. Like research an adventure journey cannot help but generate new information about self and often new information about things as diverse as: place, human capability, equipment and philosophy. Like adventure, research inevitably becomes a journey, usually with an uncertain outcome, often with associated risks. Researchers and adventurers both seek to push back frontiers, be that knowledge, or capability. And knowledge and capability are intrinsically linked to one another. The more we know, the more we are capable of; the greater our capabilities, the more we are able to know.

Siloed thinking is a common pitfall in academia, i.e., fields of study pushing forward their particular knowledge frontiers in isolation. Conferences are strategic staging posts to facilitate cross-pollination between fields that have common interests. Outdoor pursuits and biomechanics are two such fields that have broad areas of overlap and much to offer each other in the way of opportunities created through research.

Adventure sports are increasing in both their profile and relevance to society. As societies aversion to risk strives to make life ever safer, individuals seek out adventure experiences to fill the void. Innately people feel the value of a certain level of exposure to risk in their lives. Recent research in human development supports the importance of risk to healthy brain development. I think every parent would rather their children learn about risk climbing trees in their childhood rather than behind the wheel of a turbo charged car experimenting with alcohol.

Participation in adventure sports has increased dramatically this decade. In the last thirty years, extreme sports participation in the United States has more than tripled. I'm constantly surprised at the low level of research in the domain of adventure sports. I guess in part it is because recreation draws a lower level of funding than elite sport. But adventure sports have their own elite profile which is developing at pace. The 2012 Olympics features white-water slalom kayaking and canoeing and mountain biking, and the X-games is a big money event. Many of the adventure sport pursuits have their own world championship event.

Recreation sports and outdoor pursuits also have a growing profile in the tourism sector as adventure tourism opportunities. New Zealand uses adventure pursuits in much of its advertising imagery.

Recreation is increasingly being recognised as vital to health outcomes and key Governmental objectives are focused on health outcomes. In New Zealand there is a massive increase in investment in recreation research by Sports New Zealand in recognition of the value of recreation to society.

I am of the opinion that biomechanics research can contribute significantly to the adventure sport domain by helping improve performance and reduce injury risk. Most outdoor recreators who have pushed their mind and body toward their various breaking points will be able to relate a tale of a body part reaching its limit the way it was used. I can remember a training trip for the Antarctic expedition where I developed a repetitive strain injury in my wrist. I had to relearn how to paddle again in a way that enabled my body to handle the mileage I intended to subject it to.

I had learned the same lesson on a mountaineering trip to Mount Cook. Starting the day fresh and confident in my walking and climbing abilities, finishing the day a cripple, lucky to make the hut ahead of a storm. Again I had to relearn how to put one foot in front of the other on a hill, in a way that would enable my body to climb what I wanted to climb. It was a humbling experience.

The biomechanics of kayaking has evolved dramatically since I first became involved with it 20 years ago. If I take the simple Eskimo roll, the current best-practice technique for self-righting a kayak does not resemble the style of 20 years ago, except that both turned the kayak right-side up. I suspect the 20 year development process was the result of the slow evolutionary pathway of trial and error, rather than through strategic biomechanical studies focusing on the ergonomically best means to right a kayak. But it seems to me this is what has evolved. If biomechanists had been strategically involved 20 years ago they could have saved us 20 years of doing it the hard way!

One of the ironies of adventure expeditioning is that adventurers endeavour to engage with the unknown, ostensibly because of the challenge that the unknown presents, yet they seek to gain every advantage from technology and available information to lower the challenge in order to make it achievable. That is how the frontiers of adventure sports are pushed back. Less so from greater talent as by greater technology and greater knowledge, building on the efforts of those that have gone before. The application of biomechanical design principles to adventure equipment has led to dramatic improvements in performance. Pack harness systems that take into account the way the body moves have enabled practitioners to travel greater distances using less energy. Modern ice tools require far less strength to use and hang from enabling steeper ice to be climbed successfully. There are many examples of improved ergonomic functionality of outdoor equipment and there are still rich areas for further equipment development as materials evolve or become cheaper and new technologies are developed.

The pogies we developed to keep our hands warm on our expeditions were modelled off those used by Eskimos. Again, the result of a slow evolution of trial and error. Ours were

made out of closed-cell foam rather than seal-skin, using a heavily bandaged fist holding a paddle with closed-cell foam, softened in a kitchen oven, draped over it. They were brilliant and are one example of how pushing new adventure frontiers develops new technologies (or advances old technologies as in this case).

Expeditions provide rare opportunities for intensity over long periods of time, both during training and on the expedition. Challenging objectives are conceived; it is a test of both one's equipment and body; the mind can overcome a certain amount of matter, but the functionality of the body and the functionality of one's adventure tools are critical to success.

At AUT we have conducted a number of studies into rope and sling analysis for climbing and kayaking. Climbers and kayakers use synthetic cordage in particular ways. Some uses, or misuses threaten to approach the breaking strain of these materials and analysis has helped to dispel myths and support best practice usage of these materials. This research simply provides more complete information that outdoor practitioners can base their decisions on, decisions that they often trust their lives to.

One of the papers I run at AUT University is an undergraduate paper called Outdoor Project. The learning outcomes focus on investigative skills and the project must be related to the outdoor industry. The scope of these investigations is in the nature of a pilot study, and several have focused on biomechanical aspects. For example:

- Sea kayaking direction control using weight distribution: Explored the design characteristics of currently available sea kayaks that facilitated steering by canting the hull with the lower body, or what is termed bilge steering. This information gave people considering a sea kayak purchase information about the ease with which a particular kayak would respond to steering without the use of the rudder.
- Efficiency of rescue method in white water kayaking: The range of whitewater rescue techniques were compared for the appropriateness of a variety of situations. It applied theoretical practice to the reality of various river scenarios. A similar study was conducted with the range of rescue methods available to sea kayakers comparing efficiency. These studies provided practitioners with observations that might otherwise take a lifetime to accrue through random experience and reflection.
- The roll station: Investigated the use of a teaching aid for Eskimo rolling instruction exploring the biomechanical advantages of utilising a float as an aid in coaching of the rolling progression.

Researching activities categorized as extreme sports or even outdoor pursuits presents some challenges to researchers. These activities differ from traditional sports due to the higher number of inherently uncontrollable variables. Participants in these activities compete not only against other athletes, but also against environmental obstacles and challenges, which are often inherently hazardous. These environmental variables are frequently weather and terrain related, including wind, snow, water and mountains. Because these natural phenomena cannot be controlled, they inevitably affect the outcome of the given activity or event. Biomechanists are encouraged to work with those actively engaged in the outdoors and extreme sports environments to conduct research to improve performance and reduce injury risk in these events.