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Human Performance Lab Newsletter, March 2008

St. Cloud State University

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Human Performance Lab News & Views

Department of Health, Physical Education, Recreation and Sport Science

MARCH 2008

KELLY'S CORNER

-David Bacharach

"It's tougher to stay on top than
the struggle to get to the top."

~Don Shula

WELCOME TO CAROL SHAW

Every year we hear new buzz words and for some reason this year the word "hybrid" comes to my mind. The most often used dictionary definition is something like this: the offspring of two plants or animals of different species, varieties or genera, usually produced through human manipulation for specific desired characteristics. Or perhaps hybrid can follow a more complex definition such as: a word composed of elements drawn from different languages, such as *television*, whose components are Greek and Latin. But, for me it used to be a lot simpler. Hybrid meant a new type of seed corn; DeKalb, Pioneer, Jake, etc... and we had the hats to prove it. But all that has changed. There are hybrid flowering plants genetically matched to tolerate harsh winters, mixed fruits from one tree, bicycles designed specifically to ride in the city, or computers that can be converted from laptops to desktops. One can even find hybrid golf clubs that are easier to hit and guaranteed to take strokes off your game.

These are but a few ways hybrid is currently being used. If one were to "Google" the term "hybrid" one would find cars at the top of the list. Not just little cars like the Toyota Prius but big Chevy Silverado trucks. The same hybrid search will land you a host of links such as the \$49 super deal from "gasinwater.com/RunYourCarWithWater" complete with a 56 day money back guarantee. As I continued to expand my understanding of the term hybrid, I got more intrigued as to what this all meant. After several hours of mind numbing web surfing, it boiled down to the most fundamental question of all, "So what?" Buzz words or new terms are used to help us describe trends that appear in society and although some are more fleeting than others, I think hybrid will be with us for awhile. In fact, I think we'll be seeing it used even more often in the future. If we look closely at the original definition of hybrid one can see the beauty of mixing things from different entities to create a better one. We do that all the time.

In areas of health we can change our diets to reflect a better balance of nutrients. We can put together a hybrid fitness program. A little aerobic activity, a little strength training, some stretching, drinking water instead of soda and bingo! We have a "hybrid" program, new and improved! The best kept secrets of health fitness gurus around the world are now out in the open. Mix, match, alternate, add or subtract. However, the key to success is doing it. I am doubtful that the hydrangeas we planted last year will survive our winters. I do not think driving hybrid cars will do much to reduce our dependence on oil. I'm not convinced we can all convert our cars to run on water; but, I do think the human body is in fact a hybrid of many sorts and that to keep it running well it needs activity and fuel. Changing activity and eating a variety of healthy foods will take you a long way down the road of good health. Who knows, maybe you'll find the right hybrid program to keep you going long after your Prius or Silverado is dead and gone. So as always, let's try to live the best we can, take care of ourselves and be thankful for everything that we can do in our lives.

The faculty and staff of the HPL want to introduce Carol Shaw as the newest member of the HPL family. Carol has taken the position of program coordinator vacated by Barb Kunze's retirement last spring. Carol is usually the first voice and/or face people encounter when contacting the HPL and for that reason, an essential part of our success. In welcoming Carol we would like to let everyone know a little more about her and how she came to be with us.

Carol is originally from the Eden Valley-Watkins area but has lived near Foley for the past 15 years. She and her husband have 40 acres where they enjoy many outdoor activities. They have a few cows, horses, sheep, pigs, chickens, ducks and geese. Carol enjoys gardening and, in addition to growing vegetables, she has planted various fruit and nut trees. She also has ideas for their farm that she hopes to accomplish someday such as putting up a wind turbine and installing solar panels to power daily farm tasks.

Carol is new to the Lab, but not to St. Cloud State University. Twenty years ago she started part-time with the Department of Interdisciplinary Studies. Since then she has worked in the Psychology, Statistics and, most recently, Math Department. One draw to working in the HPL was allowing Carol to return to part-time status. With a reduced workload she is looking forward to spending more time with her six grandchildren and being able to do some other things around the farm.

Carol has always been interested in nutrition and is amazed at how the body works. Along with the services the lab provides to the campus and the community, the knowledgeable staff and interesting projects students undertake teach her new things every day. This is a perk she did not anticipate when taking the position. She has not yet claimed her favorite part of the Lab, but the fact that there is always something new is gaining her attention. Each time she thinks she has figured out the current project, the staff takes on something else.

We are excited to have Carol down in the HPL with us. Please introduce yourself the next time you come down, whether it is for an Adult Fitness Test, other research, or if you are just passing through. And thank you, Carol, for coming on board!



NEW FACES IN THE LAB

Sam Johnson is from Burnsville, MN and is a 2007 graduate of St. Cloud State with an elective studies degree focused on biology, chemistry and sport science. He is pursuing a master's degree in exercise physiology and is interested in earning a PhD in the future. Sam is a fourth year member and two year captain of the university track and field team where he competes as a sprinter and long jumper. He also enjoys football, baseball and technology.

Mindy Hansen is a first year grad student pursuing a master's degree in exercise physiology. Actually Mindy is a graduate assistant with the strength and conditioning department at SCSU, but just can't get enough of the Human Performance Lab! After starting a business and being in the workforce for seven years post-undergrad, getting back into the academic world has been a challenge. And although there are pros and cons to taking such a large break between undergraduate and graduate programs, the biggest benefit of having that time off is to come back with the desire to understand what is being taught and to know why you are in the program. For Mindy, understanding metabolic processes and energetics are at the top of that list.

Tom Ebnet grew up in St. Cloud and is excited to return and continue his education here. Tom first attended the University of St. Thomas to study business and play basketball, but an interest in exercise science and physiology caused him to transfer to the University of Wisconsin—Eau Claire where he graduated with a degree in exercise science in 2006. Tom is currently pursuing a master's degree in exercise physiology and plans to continue with a PhD program in the fall of 2008. Tom's internship consisted of assisting with summer and fall physical education and sport science courses at SCSU. Tom's thesis plan involves the development of a regression equation for various populations to elicit an optimal or peak VO₂max (cardiopulmonary function) test on a treadmill.

Lara Stone is originally from Windsor, NY and a 2004 graduate of the State University of New York at Cortland where she earned a bachelor of science degree in kinesiology. She moved to Minnesota in 2006 to pursue a master's in Special Studies with a concentration in Cardiac Rehab. Lara recently observed the cardiac rehab department at St. Cloud Hospital for her internship. She is currently writing a starred paper about the effects of enhanced external counterpulsation on the cardiovascular system and she plans on taking her ACSM Exercise Specialist Certification in the spring of 2008. Lara likes to eat ice cream and really enjoys a nice pair of slacks.

Andy Gray is from Kempton Park, South Africa, and came to the states to do his undergraduate work at the University of South Carolina Upstate. He graduated from there in 2005 with a bachelor of science degree in physical education/corporate fitness. He is now in his second year at St. Cloud State pursuing a master's in Special Studies—Prosthetic Physiology. He is working on his thesis entitled "The Minimum Vacuum Level Required to Maintain Limb Volume in Trans-tibial Amputees during Ambulation". This vacuum range will allow designers of the vacuum-assisted prosthesis to use miniature electronic pumps in place of the mechanical pump currently used. Last summer he completed an internship at Richmond Bone and Joint in Richmond, Texas, which was an invaluable educational experience. Andy enjoys football (played with the round ball), running and reading.

FUN PHYSIOLOGY FACTS

~Mindy Hansen

- ◆ The surface area of the average persons lungs are the size of a singles tennis court.
- ◆ There are over 60,000 miles (97,000 km) of blood vessels in a child's body and close to 100,000 miles (161,000 km) in an adult's.
- ◆ The circumference of the earth at the equator is 25,000 miles. If the blood vessels were lined up end to end, they would circle the equator 4 times!



Left to Right: Andy Gray, Lara Stone, Mindy Hansen, Sam Johnson, Tom Ebnet



2nd YEARS—WHAT THEY'RE UP TO

John Schapman spent this past summer interning at USA Triathlon in Colorado Springs, Colorado and was able to spend a little time working at the Olympic Training Center. He is working on a thesis this year involving the rate the stomach empties into the intestine when consuming a carbohydrate and protein sport drink versus a carbohydrate-only sport drink. In January John spent four weeks in Manchester, England working with local cyclists collecting his thesis data since methods of data collection have been tested to a greater extent there.

Andy Bjorklund is working towards a masters in Special Studies-Cardiac Rehab. He did an internship in cardiac rehab at the St. Cloud Hospital last May and June. He's currently working on his thesis which is a comparison of perceived work done vs. actual work done in an occupational warehouse setting. He is currently engaged and has plans to be married July of 2008. Upon graduation he is hopeful to start his career in a related field.

Ana Freire is in her second year of the Biomechanics Master's program. She is currently working with SCSU dance minors for her thesis project. The thesis topic is the "effects of a turnout training program on hip external rotation, pelvic tilt and knee valgus torque". Ana is also beginning a year-long internship with the St. Paul City Ballet where she will be teaching ballet classes and working with faculty and staff on injury prevention.

Rita Moravec completed her internship at St. Cloud Orthopedic working with high school athletes in the H.E.A.T. (High Energy Advanced Training) Program. She really enjoyed the experience that combined her passion for fitness and health with her love of teaching. This year she will be finishing classes and working on a starred paper for a Master's of Science Special Studies with an emphasis in Sports Training.

Cristina Nistler is a second year graduate student working on a Master of Science—Sports Medicine degree. This year she is working with the softball and women's hockey teams as a student athletic trainer. She is also beginning work on a thesis which is a case report on an amateur baseball athlete undergoing non-operative ulnar collateral ligament treatment.

HPL RESEARCH ACTIVITIES

~John Seifert

2007 was a busy year for presentations coming out of the HPL. The year ended with two presentations at the International Congress of Science and Skiing in St. Christoph, Austria. Dr. Dave Bacharach delivered a presentation entitled, '*Diet and muscle fatigue during two weeks of alpine ski training.*' In short, Dr. Bacharach concluded that despite encouragement to eat, ski racers were in a 500-600 calorie deficit per day during on-snow training. This caloric deficit was mitigated by ingesting energy gels during training. Dr. John Seifert presented, '*The relationship of heart rate and lactate to cumulative muscle fatigue during recreational alpine skiing*' at the same conference. Although heart rate is a good index of acute fatigue and stress, it is not a good indicator

of long term or chronic fatigue during alpine skiing. Blood lactate on the other hand showed promise for such an index.

The HPL was also well represented at other conferences last year. Former and current graduate students made their marks at the Northland chapter meeting of the American College of Sports Medicine (ACSM) in March, as well as the National meeting in New Orleans in May. Additional presentations were delivered at the American Heart Association's meeting on Hypertension and the International Society for Hypertension. The 2008 campaign appears to be headed down the same path with numerous abstracts accepted for presentation at the National ACSM meeting in Indianapolis at the end of May.

CONGRATULATIONS!!

The faculty and staff of the Human Performance Laboratory would like to acknowledge and congratulate

Kate Barnett and Nate Hendrickson

who completed their thesis work and earned a Master of Science degree in 2007.

2007 NATIONAL ACSM PRESENTATIONS

John G. Seifert and Rochelle McKenzie, *A Carbohydrate/Protein Energy Gel Improves Swimming Performance in Collegiate Swimmers*

Andrew J. Bjorklund, Nathan Hendrickson, John G. Seifert, *A Comparison of Two Testing Methods for Knee Extension Endurance*

Joe Harmon, James Burckhard, John G. Seifert, *Ingestion of a Carbohydrate-Protein Supplement Improves Performance during Repeated Bouts of High Intensity Cycling*

Ana B. Freire, Glenn M. Street, *Contribution of Hip External Rotation to Turnout in Adult Female Ballet Students*

John T. Schapman, David Bacharach, FACSM, Maria Schilling, *Changes in Aerobic and Anaerobic Capacity in CUSSA Junior Alpine Skiers*



ELLIPTICALS VERSUS TREADMILLS ~ Lara Stone

Treadmills and ellipticals can be excellent tools for an indoor aerobic workout. When comparing the two machines one should realize that both offer a good workout, but yet each one has its own unique aspects.

To be a little more specific, ellipticals have less of an impact on the lower body than a treadmill. This creates less of a "pounding" effect on the legs and lower back. People with knee or other lower extremity injuries may benefit more from an elliptical. Most ellipticals offer a "total" body workout using handlebars for your upper body and foot pedals for your lower body. The combined effort of upper and lower body provide a similar caloric expenditure to that of using a treadmill with perhaps a lower risk of injury. Ellipticals can therefore provide a good cardiovascular workout.

But please do not rule out treadmills! Treadmills are usually easier to control with simple changes in speed or elevation. A treadmill can easily replicate walking, jogging, or running in a very controlled environment. Since most people are comfortable with walking and/or running, treadmills are still the preferred machine by most indoor exercisers.

Physiologically, both machines are effective at producing cardiorespiratory benefits as well as increasing calories burned. The ability to change one's workout program on either machine will continue to keep them as favorite aerobic devices in the future. If people are able to keep motivated by changing routines, then switching between machines is a good thing.

Some exercisers suggest ellipticals are awkward in that the foot pedals

are farther apart than normal walking. This adds extra strain on hip muscles and causes an unnatural gait. If this is the case, then alternating equipment for short intervals (5-10 min) may be a way to allow your body to accommodate to the new elliptical motion. But remember, for the best results, increase either the intensity or the length of your workout in an appropriate fashion to insure safety and enjoyment with indoor exercise.



AVOIDING BRITTLE BONES ~Glenn Street

From middle age on there is an unavoidable, gradual decline in bone strength. If our bones as young adults are relatively weak, the decline in strength usually leads to brittle bones (osteoporosis) in our elderly years. In contrast, if we enter middle age with strong bones it will take years/decades longer for our bones to become brittle. Often osteoporosis can be avoided altogether if we begin with strong bones.

The prime window of opportunity for strengthening our bones is childhood and the early teenage years. One study that compared the strength of bone between the dominant and non-dominant arms of young adults who had played racquet sports since elementary school had 22% stronger bones in the dominant arm. Subjects who started playing racquet sports after high school only gained 5% in bone strength in the dominant arm.

So as parents and grandparents we have a wonderful opportunity to influence the health of our children's and grandchildren's bones. By encouraging them to be the kids that can't be pulled off the playground, we may help them avoid osteoporosis in their lifetimes.

*"We don't stop playing
because we grow old,*



*we grow old because
we stop playing."*

PROSTHESIS LIMB VOLUME LOSS IN AMPUTEES ~Andy Gray

The following is an abstract of a thesis project being done by Andy Gray entitled "Minimum Vacuum Level Needed to Maintain Limb Volume in Trans-Tibial Amputees During Walking".

Below-knee amputees struggle to maintain a good fit while wearing a prosthesis. The poor fit can cause limb volume to be lost and this can consequently allow excess movement of the limb inside the socket. Until recently this was considered a normal occurrence. However, with the advent of the total-weight surface bearing vacuum socket, this loss of limb volume has become less of a problem for those opting to wear it. Studies conducted by past students of the SCSU Human Performance Lab (Board, Beil and Goswami) further proved that limb volume increased when in a vacuum socket (-23" Hg) and decreased when wearing a suction socket (0" Hg). It is theorized that between these two conditions lies a range where the limb neither gains nor loses volume. This is of particular interest when dealing with mechanical and electronic vacuum pumps. Information gathered would aid in selection of batteries and the design and marketing of the prosthesis. Therefore, the purpose of the research is to determine the minimum vacuum level needed to prevent limb volume loss when walking with a prosthesis.

ALUMNI CONTRIBUTION—MASSAGE ~Mark Blegen



Getting a massage is typically something we think about only when we are stressed. Or maybe if we are lucky, someone gives us a gift certificate for a relaxing day at the spa. Over the past decade competitive and recreational athletes alike have discovered the benefits of massage. Numerous research studies have shown what massage therapists, practitioners, and those that receive massage have known for years: it works. Several studies have examined the effects of massage on performance, recovery, prevention of musculoskeletal injury, and even its role in weight management and found positive benefits. The reasons behind these positive aspects are varied and include biomechanical, physiological, neurological and psychophysiological mechanisms.

Biomechanically, passive and active stiffness can be decreased while range of motion can be increased. On the physiological side, massage can increase skin and muscle temperature, increase blood flow, and induce positive changes in hormone levels. Neurologically and psychophysiological, massage can alter neuromuscular excitability, and decrease both anxiety and fatigue. It is easy to see how these effects might enhance ones performance and/or recovery from both training and performance.

Two recent studies undertaken at the Applied Exercise Science Laboratory at Springfield College addressed massage's influence on recovery. One study has shown that massage causes soreness perception to decrease after a training session designed to induce muscle damage while flexibility of the hamstrings and back increases. Preliminary analyses also showed creatine kinase, a marker of muscle damage, decreases at a greater rate with massage. The second study is ongoing and is designed to look at massage's impact on weight management. Cortisol, a stress hormone that stimulates hunger and has been implicated in weight gain and fat redistribution, is being measured with and without massage. It is thought that massage may reduce cortisol which then allows individuals to have more control over their dietary consumption and increase their weight loss.

The benefits of massage go beyond just relaxing for a few moments. Massage has the potential to positively affect everyone: athletes may recover more efficiently, business people can lower anxiety, and we may even be able to shed a few pounds.

Mark Blegen is an Assistant Professor at the College of St. Catherine in Minneapolis. He earned a BA in Sport Science from St. Olaf in 1994, a MS in Exercise Science from SCSU in 1996, and his PhD in Exercise Physiology from Kent State in 2001. He first taught at Mount Union College in Alliance, Ohio. While there he was an assistant football coach when they won two D-III National Championships. He then taught at Springfield College from 2004-2007 before coming back to Minnesota. He and his wife, Kristin Schroeder, are glad to be back in the area and most of all, they are the proud parents of their newborn daughter, Krin.



EFFECTS OF INTENSE EXERCISE ON THE FEMALE REPRODUCTIVE SYSTEM ~Ana Freire

Exercise is known to be beneficial for our overall health, but rigorous physical activity is associated with a set of risks for the female athlete or dancer known as the female triad. The female triad is comprised of an eating disorder, amenorrhea and osteoporosis. The female reproductive system is highly sensitive to physiological stress, and the most common disorders found in elite level performers include delayed menarche, primary and secondary amenorrhea, and oligomenorrhea. The prevalence of dysfunction depends upon the type of activity and the level of competition.

Usually, in activities that emphasize leanness over strength such as ballet, long distance running, and figure skating, the inadequate nutrition (insufficient or unbalanced calorie intake) associated with excessive caloric expenditure induces the athletes into a hypometabolic state.

The energy drain compromises the production of important pituitary hormones associated with the reproductive system, and ultimately inhibits the production of estrogen in the ovaries.

Recent studies have associated that condition with low levels of the hormone leptin, which is a base metabolic regulator and is produced in the hypothalamus and adipose tissue.

Reproductive dysfunction compromises bone formation and athletes are in risk of not attaining peak bone mass. This is also aggravated by the lack of estrogen which regulates the rate of bone reabsorption. Studies have indicated that even after correcting reproductive dysfunctions, the bone loss cannot be reversed.

It is very important that coaches and teachers pay close attention to their female performers, so that any dysfunction could be treated as soon as possible. The longer the dysfunction persists, the greater the bone loss and the risk of osteopenia/osteoporosis, as well as infertility.

Intense exercise alone does not induce reproductive dysfunction, as long as the athletes get adequate nutrition and rest. Train smart!



Human Performance Laboratory
 111 Halenbeck Hall
 St. Cloud State University
 720 Fourth Avenue South
 St. Cloud, MN 56301-4498

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Please contact Carol Shaw if your address has changed.

Phone: 320-308-3105

Fax: 320-308-5399

Email: cashaw@stcloudstate.edu



THANK YOU, THANK YOU, THANK YOU!!!!



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Should you be in a position to make a contribution to the HPL, please make checks payable to:

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Alumni & Foundation Center

720 Fourth Ave. S.

St. Cloud, MN 56301-4498



HPL Staff (L to R): John Seifert, Carol Shaw, Glenn Street, David Bacharach