



Spring 2006

American College of Sports Medicine

A Message from the President



John R. Halliwill, PhD, FACSM

vaulter Tommy Skipper used his own momentum to clear a height of 19 feet – a new school record. As Tommy proved, momentum can take you to new heights.

Right now we have a lot of momentum in the Northwest Regional Chapter. We are fresh from a wildly successful 2006 Annual Meeting in Corvallis. It was a great program, packed full of outstanding speakers. Attendance was far better than we could have expected. Congratulations to Tony Wilcox for organizing the outstanding program. Kudos to the speakers, for sharing with us their passion for the field.. And hats off to the faculty at Gonzaga for bringing an entire bus load of students to the meeting! We have also had an amazing year for gathering sponsorship from great supporting businesses. This is a credit to Steve Conant, Frank

Momentum. It's what keeps us moving; keeps us going places. I had the great fortune of seeing momentum at work one Saturday afternoon at the Oregon Preview track meet. Momentum had been building, event-by-event, as the athletes tested themselves for the first time this season. Then, in one of the final events of the day, pole-

Stanek and other board members, who have worked hard to promote our chapter to the sponsors. We also brought in some fresh new blood on the executive board—new to the board this year are Julie Downing, James Laskin, Marisa Hastie, and Jessica Meendering. The goal is to harness this momentum to reach new heights for the Chapter. How are we going to do this?

Expect to see many changes this year as we are undertaking a major review of our business practices. You may have noticed that our chapter is “not like the other chapters” in ACSM. We have a track record of innovation and trendsetting among the regional chapters and we are setting the bar high. We look closely at our annual members surveys and the feedback we received from the Annual Meeting. We are also listening to what members have to say. This is how we receive the key information that helps us help you. So, if you receive an e-mail about a survey from NWACSM, please take the time to answer—it will help us better serve you in the future. In response to our previous members surveys, we have already begun with a number of new initiatives. To begin with, the next three annual meetings will be held at the Seattle Center in downtown Seattle. We are trying out a permanent home for the meeting that combines convenient location with a great place to visit—just what you asked for! Dan Heil is already busy lining up a great meeting for Seattle 2007. Keep the momentum going Dan!

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Northwest Region Newsletter

Spring 2006

NWACSM Mission Statement

It is the mission of the Northwest Chapter of the American College of Sports Medicine to provide educational opportunities for professional development in exercise science and sports medicine and to be a resource for the general public regarding sports medicine and health and fitness issues.

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Newsletter Submission Deadlines

<i>Issue</i>	<i>Deadline</i>
Summer	July 17, 2006
Winter	Nov. 20, 2006
Spring	March 12, 2007

The ACSM Northwest Region Newsletter is produced by Henriette Heiny, Ph.D., FACSM, Director of the International Institute for Sport and Human Performance, University of Oregon. Members of the ACSM Northwest Region are invited to submit contributions to the newsletter.

NWACSM information can also be seen on the Internet, URL: <<http://northonline.sccd.ctc.edu/nwacsm/>>

President's Message cont.

In addition, the executive board is working with marketing / communications professionals to improve the way we serve you. Want to be involved? We can use help many of areas. Some of you may have noticed a well-dressed man circulating around at the NWACSM Annual Meeting in Corvallis, and you may have been curious as to why he was asking questions of so many people. His name is Michael Blanck and he is a marketing consultant. He is part of a bold new strategy in our Chapter aimed at increasing awareness and participation within our Chapter activities and programs. Basically, his job is to make us better. While our board consists of top-level lecturers, fitness experts, scientists, and healthcare professionals, we lack expertise in other areas. Michael will coach us in areas such as getting our message out, recruiting sponsors, and improving our communication with our members. All this will keep our momentum building!

Momentum. We have it, and we're using it to strive for new heights. Exciting things are going to happen!

—John R. Halliwill, PhD, FACSM
NWACSM Board President

Future Annual Meetings

Save the dates on your calendar for the next three Annual Meetings at the Seattle Center in downtown Seattle:

2007	Feb 16-17
2008	Feb 29-March 1
2009	Feb 20-21



Upcoming Events

Come to Florida and Celebrate 10 Years of ACSM's Health & Fitness Summit!

ACSM's Health & Fitness Summit celebrates its tenth meeting April 11-14, 2006 in sunny Florida at the Buena Vista Palace in the Walt Disney World resort in Orlando. In addition to the four outstanding keynote addresses below, you will see over 100 presentations in 9 tracks. Visit www.acsm.org and register online.

KEYNOTERS:

Barry Franklin, Ph.D., FACSM

"Don't Be As Dumb As An Elephant: A Potpourri of Changing Health-Fitness Paradigms and Perceptions"

Opening Keynote: Tuesday evening, April 11

Jim Pawelczyk, Ph.D., FACSM

"Can Humans Survive a Trip to Mars?"

Wednesday, April 12

Carolyn Kaelin, M.D.

"Health and Breast Cancer – Life Beyond the Dichotomy – A Survivor's (and her Trainer's) Guide to Rehabilitation and Fitness"

Thursday, April 13

Lawrence Golding, Ph.D., FACSM

"ACSM Summit from Adolescence to Adulthood; Where Will We Be In 2016?"

Closing Keynote: Friday, April 14

ACSM Annual Meeting

Don't Miss the opportunity to receive a reduced registration rate to ACSM's Annual Meeting—April 15 is the last day to receive a discounted registration rate for the upcoming ACSM Annual Meeting to be held May 31-June 3 in Denver, Colorado. Don't miss this conference offering the very best in the science of sports medicine with up to 25 simultaneous sessions in a true resort setting! For the session schedule, access to the online registration process, and online hotel reservation service, visit the Annual Meeting page of the ACSM Web Site.

11th World Sport for All Congress

Abstract Deadline for the 11th World Sport for All Congress is May 1.—Organized for the first time in Havana, Cuba, on October 31-November 3, 2006, the congress will bring together experts from across the world to debate a major theme: "Physical Activity: Benefits and Challenges." The congress is organized by the Cuban Olympic Committee, under the patronage of the International Olympic Committee, in collaboration with the World Health Organization (WHO) and the General Association of International Sports Federations (GAISF). ACSM representatives presenting at the conference include: William O. Roberts, MD, FACSM; James Skinner, PhD, FACSM; and Walter Thompson, PhD, FACSM. Authors may submit no more than two abstracts, of which the Congress Program Committee can select only one. The abstracts and the abstract submission forms must be received by the Congress Secretariat by May 1, 2006. To submit an abstract or obtain congress information, visit the Congress Web Site



A Proprioceptive Neuromuscular Application to Sports Medicine PNF Rehabilitation of the Shoulder and Upper Extremity

University of Oregon—International Institute for Sport and Human Performance
Friday, May 19, 4:30 PM-9:00 PM
and Saturday, May 20, 8:00 AM-4:45 PM
Registration Deadline: April 28, 2006

Workshop Information.

A brochure with registration form is available at <http://www.uoregon.edu/~iishp/PNF.html>

Course Description

The purpose of this 11-hour course is to give the participant an introduction to the use of PNF techniques. Specifically, the techniques presented in this course are designed to enhance the function of the shoulder girdle and upper extremity by providing specific neuromuscular reeducation. These techniques serve the orthopedic and sports injury as well as the neurological patient. The course is appropriate for physical therapists, physical therapy assistants, athletic trainers, occupational therapists, certified occupational therapy assistants, and massage therapists.

Registration Fee

The class is limited to 22 participants. Registration is open to students and the professional community on space-available basis. Workshop fee is \$295.

All participants will receive a certificate of attendance from the International Institute for Sport and Human Performance (IISHP) following completion of the course. IISHP is recognized by NATABOC to offer continuing education for certified athletic trainers—NATABOC Approved Provider P737. 11 CEUs may be applied for at the time of on-site registration.

Contact Information

For more information about this workshop go to: <http://www.uoregon.edu/~iishp/PNF.html>, call (541) 346-4114, send an e-mail to Roberta Thompson at rlt@uoregon.edu, or send a letter to: IISHP, 1243 University of Oregon, Eugene, OR 97423-1243.

Elements of Physical Therapy for the Pre-PT Workshop

University of Oregon—International Institute for Sport and Human Performance
Friday, June 2, 12:00 Noon-4:30 PM
and Saturday, June 3, 9:00 AM-4:30 PM
Registration Deadline: May 19, 2006

Workshop Information.

A brochure with registration form is available at <http://www.uoregon.edu/~iishp/Pre-PT.html>

Course Description

This course will provide the pre-physical therapy student with an introduction to many ethical, professional, and clinical aspects of the profession of physical therapy. Individuals may find these topics helpful in guiding their decision to enter the profession of physical therapy. This course will also provide a brief description of the role of the physical therapy aide as well as the ethical and legal issues pertaining to the use of aides.

This course is offered as an adjunct, not in lieu of the Oregon Administrative Rules method requirements pertaining to Physical Therapy Aides. It is provided only as a pre or post-preparation to actual on-the-job training.

Registration Fee

Registration is open to students and the professional community on a space-available basis. Workshop fee is \$250. Students, \$195 (Valid student ID required). 10 CEUs may be applied for.

See opposite column for contact information.

Western Washington University offers enhancement workshops for Summer 2006

PE 445B Nutrition & Performance: Overview
TWR 05:00-07:50 pm CV 116 1 credit
June 20, 21 & 22 + one hour arrange

PE 445D Storytelling and Sports
MTWR 05:00-07:50 pm CV 116 2 credits, Class meets
July 5, 6, 10, 11, 12, 13 + 2 hours arrange

Both are evening workshops facilitated by Lorrie Brilla.



NW Chapter Activities and News

Comments from the Member-at-Large for Fitness

First and foremost, on behalf of the NWACSM Board and the membership, I would like to thank my predecessor Steve Conant for his dedication and hard work during his Member-at-Large tenure. He had taken this role on having just concluded his National Student Representative position. Now he has gone on to the enormous responsibility as our Representative on the Regional Chapters Committee.

In order to best serve our membership, I need to hear from you. I'd like to know your needs and challenges as well as what topics and formats of programming you would like to see at the next Annual Meeting. I really enjoyed the colloquia format that Steve started this year and would appreciate hearing from you for ideas for a specific topic for next year. In addition, are there any specific topics and/or speakers that you would like to see presented at next year's meeting in Seattle? Given my passion for working with people with physical disabilities and chronic illnesses, I would like to find out who else in our chapter is working with these populations. Would a workshop dealing with disability related issues be helpful in your practice?

I look forward to the next three years facilitating the growth of the "Fitness" component of our Chapter. Thank you for your support and "see you in Seattle" next February.

—James J. Laskin, PT, PhD,

Member-at-Large, <james.laskin@umontana.edu>

WSU Spokane Earns Gold-Standard ACSM Exercise Specialist® Certification

Students pursuing the Exercise Physiology and Metabolism (ExMet) degree at Washington State University Spokane will study in one of the select programs now endorsed by ACSM. The ExMet

degree program's curriculum—the only program of its kind in the Northwest region; it is part of the Program in Health Sciences. The curriculum integrates exercise and nutrition by focusing on the biological and social/psychological interrelationships and the effect of this interaction on the health of individuals. This program not only prepares students to meet the nationwide demand for health care professionals, but its curriculum covers the knowledge, skills, and abilities necessary to prepare students for the ACSM Exercise Specialist® certification examination. An ACSM Exercise Specialist® is a healthcare professional certified to deliver a variety of exercise assessment, training, rehabilitation, risk factor identification, and lifestyle management services to individuals with or at risk for cardiovascular, pulmonary, and metabolic disease(s). These services are typically delivered in cardiovascular/pulmonary rehabilitation programs, physicians' offices or medical fitness centers. The Exercise Specialist® is also competent to provide exercise-related consulting for research, public health, and other clinical and non-clinical services and programs.

Clinical Exercise Physiologist needed

Washington State University's Program in Health Sciences invites applications for a full-time, 9-month, tenure-track position at the assistant/associate professor level, at its WSU Spokane campus. The position is available August 16, 2006. Required qualifications include a doctorate level degree in Clinical Exercise Physiology or related area, with at least two years postdoctoral hands-on clinical experience in treatment of special populations and supervision of staff and students, clinical ACSM certification (ES will be considered), demonstrated successful teaching experience at undergraduate and graduate levels in areas relevant to the position.

Continued Page 31 — CEP needed



NW Chapter Activities and News

2006 NWACSM Annual Meeting posters and oral presentation

The best poster awards

Doctorate category: Grant Simmons, University of Oregon; master's category: Stephanie Harger, University of Montana; undergraduate category: Jennifer Vincent, Gonzaga University

Best oral presentation

Doctoral abstracts:

1. The effect of the menstrual cycle on postexercise hypotension; B. M.Lynn, J.L McCord, J.R. Halliwill
2. Peak cardiorespiratory responses during aquatic and land treadmill exercise; W.M. Silvers, D.G. Dolny, and E.R. Rutledge.
3. Levonorgestrel/estradiol oral contraceptives affect brachial artery peak response during flow-mediated dilation; B.N. Torgrimson, J.r. Meendering, P.F. Kaplan, and C.T. Minson

Masters abstracts:

1. Effect of storage techniques on blood lactate concentration and determination of various lactate threshold definitions; M.J. Garver, L.J. Nielsen, J.M. Dickinson, D.S., Campbell, and C. Papadopoulos
2. GPS-based prediction of energy expenditure for slow and fast outdoor walking; J.M. McKenzie, T.F. Manning, and D.P. Heil
3. Effects of extended exercise and carbohydrate feedings on substrate utilization and muscle glycogenolysis; J.D. Wagner, S.E. Gaskill, B.C. Ruby

Undergraduate abstracts:

1. Effects of external ankle support on plantar flexed inversion; C.M. Murphy and J.Abendroth-Smith
2. Kinematic differences between shod and barefoot runners at a recreational pace; S.P. Sears, L.B. Greer, J.L. Dorn, J.M.Neil, M.L. Wamre, A.J. Zink

Abstracts submitted for student awards

Doctoral Abstracts

PERSONAL AND INTERPERSONAL ASPECTS OF ULTRA-ENDURANCE TRIATHLETE COUPLES

C. Juergens, E. Sharp, and Judith Fischer.

Texas Tech University, Lubbock, TX.

<cheryl.juergens@ttu.edu>

PURPOSE: The purpose of this exploratory investigation was to conduct a qualitative study of relationships of dual triathlete couples competing at the Ironman (IM) World Championships. This study examines ultra-endurance tri couples in terms of gender equity and time management issues. The lifestyle of IM triathletes involves tremendous work, discipline, and sacrifice. How this demanding lifestyle is negotiated within couples has been largely overlooked in the literature. **METHODS:** Six heterosexual married couples were interviewed ranging in age from 30-60 years. Number of years married ranged from 0.16 to 36 years; two couples had children. Participants had competed in at least one IM triathlon in the past year. Both partners in two couples and one partner in three couples were competing at the 2004 World IM Championships. Recruitment was by flyers posted in the Expo area and by word of mouth. Interviews were 15-30 minutes and conducted using open-ended questions. Consent forms were completed prior to the interview. Hand written notes were taken with no video or tape recording during the interview. The PI's reflections and interview notes were coded using constant comparative analysis (Strauss & Corbin, 1998). This analysis or coding method allows broad categories of data to emerge, whereby the

research continually compares data to initial codes from which patterns/similarities and differences/ variations can be identified (Strauss & Corbin, 1990). RESULTS: Couples in dual triathlete marriages tended to endorse egalitarian attitudes, behaviors, and roles in their relationships and their training. A supportive role emerged for many couples and tended to “rotate” depending on who was competing in a particular race. These triathlete couples indicated wide agreement in terms of their relationship and training priorities. Their training schedules and their commitment to training and competing tended to dictate daily activities such as what to eat and how to spend time. Due to the demands of IM training, couples discussed constraints or sacrifices they chose to make in order to compete. They especially mentioned the intense demands the “tri” lifestyle has on their finances and time resources. CONCLUSIONS: This exploratory study adds to the literature by examining relationships of dual Ironman triathlete couples. Egalitarian roles emerged as a main theme. The study was cross-sectional in design, based upon only those who volunteered, and interviews were brief. The PI recommends expansion of this exploratory study to a more complex investigation of dual IM triathlete couples and development of a closed-end questionnaire to use with a larger, representative sample.

THE EFFECT OF THE MENSTRUAL CYCLE ON POSTEXERCISE HYPOTENSION

B.M. Lynn, J.L. McCord, J.R. Halliwill, FACSM
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Factors associated with the normal menstrual cycle, mainly endogenous hormones, estrogen and progesterone are known to affect cardiovascular regulation. Estrogen has been shown to indirectly cause vasodilation, whereas progesterone is known to antagonize these actions. Currently, the effect of the menstrual cycle on postexercise hypotension has not been studied and is unknown. PURPOSE: To determine if endogenous hormones associated with the normal menstrual cycle would affect postexercise hypotension. We hypothesized that,

due to enhanced vasodilation in the ovulatory phase, postexercise hypotension and leg vasodilation would be augmented during the ovulatory phase compared to the early follicular and mid-luteal phases. METHODS: We studied eleven women (24.6 ± 4.5 yr) during the early follicular, ovulatory and mid-luteal phases. Arterial blood pressure (auscultation) and femoral blood flow (Doppler ultrasound) were measured before and after 60 min of cycling at 60% of VO_{2peak} . Femoral vascular conductance was calculated as flow / pressure. RESULTS: Prior to exercise, there were no differences in mean arterial pressure or femoral vascular conductance (both $P > 0.379$) across menstrual phases. At 60 min postexercise, mean arterial pressure was reduced from preexercise across all menstrual phases ($P < 0.001$ vs. preexercise); however, the decrease was not different across menstrual phases ($P = 0.798$) (early follicular; 2.3 ± 0.5 mmHg; ovulatory; 2.7 ± 0.4 mmHg; mid-luteal; 3.6 ± 0.5 mmHg). At 60 min postexercise, femoral vascular conductance was elevated from preexercise across all menstrual phases ($P < 0.001$ vs. preexercise); however, the increase was not different across menstrual phases ($P = 0.161$) (early follicular; $\Delta 66.9 \pm 20.5$ %; ovulatory; $\Delta 41.7 \pm 17.5$ %; mid-luteal; $\Delta 61.1 \pm 12.8$ %). CONCLUSION: In contrast to our hypothesis, postexercise hypotension and leg vasodilation were not altered by factors associated with the normal menstrual cycle.

Supported by AHA grant 555623Z.

IS THERE A HISTAMINERGIC POSTEXERCISE HYPEREMIA IN ENDURANCE EXERCISE-TRAINED MEN AND WOMEN?

J.L. McCord and J. R. Halliwill, FACSM
University of Oregon, Eugene OR 97403

In sedentary individuals, postexercise hypotension results from a histamine receptor-mediated skeletal muscle hyperemia. PURPOSE: We hypothesized that the skeletal muscle hyperemia would also exist in endurance trained individuals and would be abolished by histamine receptor antagonists. METHODS: We studied 12 endurance trained (VO_{2peak} 51.7 ± 7.9 ml·kg⁻¹·min⁻¹) men and women (20-27 yr) before and through 90 min after a 60 min bout



of cycling at 60% VO_{2peak} on a control and a combined H_1 - and H_2 -receptor antagonist day (540 mg fexofenadine plus 300 mg ranitidine). We measured arterial blood pressure (auscultation) and femoral blood flow (Doppler ultrasound). Femoral vascular conductance was calculated as flow / pressure. RESULTS: Prior to exercise, the histamine antagonists had no effect on femoral vascular conductance or mean arterial pressure ($P>0.6$). After exercise on the control day, femoral vascular conductance was elevated ($\Delta 61.2\pm 13.9\%$; $P<0.05$ vs. preexercise) while mean arterial pressure was reduced ($\Delta -4.7\pm 1.1$ mmHg; $P < 0.05$ vs. preexercise). In contrast, after exercise on the histamine antagonists day, femoral vascular conductance was not elevated ($\Delta 10.6\pm 6.7\%$; $P=0.14$ vs. preexercise; $P<0.05$ vs. control day) and mean arterial pressure was not reduced ($\Delta -1.2\pm 1.2$ mmHg; $P=0.13$ vs. preexercise; $P<0.05$ vs. control day). CONCLUSION: These data suggest that not only is there a postexercise skeletal muscle hyperemia present in endurance exercise-trained men and women but that this long-lasting hyperemia is produced by a histaminergic mechanism. Furthermore, the postexercise skeletal muscle hyperemia contributes to the postexercise hypotension in this population.

Supported by AHA grant: 555623Z

EFFECTS OF ESTRADIOL AND MEDROXYPROGESTERONE ACETATE ON FLOW MEDIATED DILATION IN YOUNG WOMEN

J.R. Meendering¹, B.N. Torgrimson¹, P.F. Kaplan¹, N.S. Stachenfeld² FACSM, C.T. Minson¹ FACSM.

¹University of Oregon, Eugene, OR. ²The John B. Pierce Laboratory, New Haven, CT.

It has been established that estrogen improves endothelial function, but the effects of progesterone and various types of synthetic progesterone, called progestins, are less clear. Medroxyprogesterone acetate (MPA) is a commonly prescribed progestin used in combination hormone replacement therapy for post menopausal women and contraception for young women. However, the effects of MPA on vascular health are unclear. PURPOSE: To determine the acute effects of MPA alone and in combination

with estradiol (E_2) on conduit vessel responsiveness in young women. METHODS: We suppressed endogenous estrogens and progesterone in three subjects using a gonadotropin-releasing hormone antagonist (GnRHa) for 14 days. On day 5 of GnRHa, two subjects were administered 0.2 mg E_2 for 5 days (GnRH + E_2), and on day 10 added 200 mg MPA for 5 days (GnRH + E_2 + MPA). One subject was given MPA beginning on day 5 (GnRH + MPA) and added E_2 on day 10 (GnRH + MPA + E_2). On days 4, 9, and 14 of GnRHa administration, wall tracking of high resolution ultrasound images of the brachial artery were used during flow mediated dilation (FMD) and nitroglycerin (NTG) administration to test endothelial dependent and independent vasodilation, respectively. RESULTS: There was no difference in baseline brachial artery diameter, shear rate, or dilation to NTG between hormone treatments ($p>0.05$). During treatment with GnRHa + E_2 FMD was greater than GnRHa alone ($9.87\pm 2.81\%$ vs. $5.65\pm 1.85\%$; $p=.039$). FMD decreased with GnRHa + E_2 + MPA and was not significantly different from GnRHa alone ($4.24\pm 0.02\%$ vs. $5.65\pm 1.85\%$; $p>0.05$). In the subject treated with GnRHa + MPA, FMD was similar to GnRHa treatment alone. CONCLUSIONS: These preliminary data support previous evidence that E_2 increases endothelial dependent vasodilation, and expand upon this finding to suggest that acute MPA administration attenuates the effects of E_2 on the vasculature.

Supported by the Medical Research Foundation of Oregon

EFFECT OF PROPRANOLOL ON SYMPATHETICALLY-MEDIATED LEG VASOCONSTRICTION IN HUMANS

T.K. Pellingier and J.R. Halliwill, FACSM University of Oregon, Eugene, OR, USA

Sympatho-excitatory maneuvers have traditionally been used to study vascular responsiveness in humans, but it is unclear if circulating epinephrine masks peripheral vasoconstriction during these maneuvers. PURPOSE: Our aim was to compare vascular responsiveness to 3 conventional sympatho-excitatory maneuvers (neck pressure, unilateral thigh

cuff release, and isometric hand-grip) before and after infusion of the beta-adrenergic blocker propranolol. We hypothesized that the vasoconstrictor response to these 3 maneuvers would be greater after the administration of propranolol. **METHODS:** Twelve healthy subjects (21-33 yrs) underwent these maneuvers while beat-by-beat mean arterial blood pressure (finger photoplethysmography), femoral mean blood velocity (Doppler ultrasound), and femoral artery diameter (edge-detection software) were measured. Femoral vascular conductance was calculated as flow/pressure. **RESULTS:** Propranolol had no effect on baseline blood pressure or femoral vascular conductance ($P>0.05$). As a result of neck pressure, femoral artery vascular conductance was reduced $23.6 \pm 3.8\%$ before versus $29.9 \pm 3.4\%$ after infusion of propranolol ($P=0.11$). After unilateral thigh cuff release, femoral vascular conductance was reduced $41.4 \pm 10.8\%$ before versus $61.9 \pm 8.4\%$ after propranolol infusion ($P=0.17$). During isometric hand-grip exercise, femoral vascular conductance was reduced $51.8 \pm 4.7\%$ before versus $54.5 \pm 2.6\%$ after administration of propranolol ($P=0.62$). **CONCLUSION:** It does not appear that epinephrine alters the vascular responses to these sympatho-excitatory maneuvers.

Supported by AHA grant 555623Z

PEAK CARDIORESPIRATORY RESPONSES DURING AQUATIC AND LAND TREADMILL EXERCISE

W. M. Silvers, D. G. Dolny, and E. R. Rutledge
University of Idaho, Moscow, Idaho

PURPOSE: The benefits of aquatic treadmill (ATM) exercise have traditionally supported its use for aerobic training during rehabilitation; however, its efficacy as a mode of aerobic conditioning for fit individuals has yet to be tested. The purpose of this study was to investigate the cardiorespiratory responses elicited during peak VO_2 protocols using an ATM and a TM. **METHODS:** Recreational male runners ($n=11$; 24 ± 4 yrs.; 179.3 ± 5.5 cm.; 72.5 ± 5.3 kg) participated in two continuous, incremental peak VO_2 protocols (1 ATM and 1 TM) until voluntary exhaustion. For the ATM protocol, subjects were

submerged in 28°C water to the xiphoid process. ATM speed was incrementally increased to 226 ± 8 m/min and water jet resistance was increased 10% every minute thereafter. For the TM protocol, speed was increased to 221 ± 18 m/min and grade was increased 2% every minute thereafter. Rest between sessions was 5 \pm 2 days. Oxygen consumption (VO_2), heart rate (HR), minute ventilation (VE), tidal volume (VT), breathing frequency (F), and respiratory exchange ratio (RER) were measured continuously with peak values used for analysis. Rating of Perceived Exertion (RPE) was recorded immediately after completion of each test and blood lactate (LA) was measured 3 minutes afterward. **RESULTS:** Significant differences were found in VE and F between ATM and TM running; however, VO_2 , HR, VT, RER, LA, and RPE values were similar for both protocols (see Table 1).

Table 1. Peak values for ATM and TM variables

	ATM	TM
VO_2 (ml/kg/min)	58.6 ± 4.0	58.8 ± 4.6
HR (beats/min)	192 ± 11	194 ± 12
VE (L/min)	$162.4 \pm 12.6^*$	$150.2 \pm 13.3^*$
VT (L)	2.87 ± 0.35	2.96 ± 0.41
F (breaths/min)	$57 \pm 5^*$	$51 \pm 5^*$
RER	1.15 ± 0.04	1.17 ± 0.03
LA (mM)	13.1 ± 2.7	12.7 ± 2.3
RPE	17.9 ± 1.3	18.4 ± 1.8

**Peak values were significantly different between protocols at $p<0.05$*

CONCLUSION: Despite differences in VE and F, it appears that the fluid resistance created by water and jets in an ATM elicits comparable cardiorespiratory responses to those seen with inclined TM running. These findings suggest that ATM running may be as effective as TM running for aerobic conditioning in fit individuals.

CENTRAL CHEMOREFLEX AND BAROREFLEX INTERACTIONS IN HEALTHY HUMANS

G. H. Simmons and J. R. Halliwill, FACSM.
University of Oregon, Eugene, OR

We have previously shown that activation of peripheral chemoreceptors with isocapnic hypoxia resets the arterial baroreflex to higher pressures and



higher levels of sympathetic vasoconstrictor outflow without changes in baroreflex gain. **PURPOSE:** We tested the hypothesis that activation of central chemoreceptors with acute hyperoxic hypercapnia also causes resetting of the arterial baroreflex, but that this resetting would not occur with matched volume and frequency hyperpnea. **METHODS:** Baroreflex control of muscle sympathetic nerve activity (microneurography) was assessed in 8 healthy men and women (20-29 yrs) using the modified Oxford technique during hyperoxic eucapnia, hyperoxic hyperpnea, and hyperoxic hypercapnia (end-tidal PCO_2 +5torr above eucapnia). Baroreflex gain was defined as the slope relating nerve activity and diastolic blood pressure (finger photoplethysmography). **RESULTS:** While mean arterial pressure was unchanged by hyperpnea or hypercapnia, heart rate increased during both stimuli from 54 ± 4 to 58 ± 5 and 58 ± 4 beats min^{-1} (both $P < 0.05$ vs eucapnia). Neither hyperpnea nor hypercapnia altered nerve activity (3075 ± 1041 during eucapnia vs 3254 ± 1056 and 2751 ± 350 total integrated units min^{-1} for hyperpnea and hypercapnia; $P > 0.8$) or baroreflex gain (-5.3 ± 0.8 during eucapnia vs -5.5 ± 1.6 and -4.9 ± 0.7 integrated units/beat/mmHg for hyperpnea and hypercapnia; $P > 0.9$). **CONCLUSION:** Thus, acute activation of central chemoreceptors with hyperoxic hypercapnia does not affect mean arterial pressure, sympathetic vasoconstrictor outflow, or baroreflex gain. Therefore, activation of central chemoreceptors does not appear to reset the arterial baroreflex.

Supported by NIH grant HL 65305

LEVONORGESTREL/ESTRADIOL ORAL CONTRACEPTIVES AFFECT BRACHIAL ARTERY PEAK RESPONSE DURING FLOW-MEDIATED DILATION

B.N. Torgrimson, J.R. Meendering, P.F. Kaplan, and C.T. Minson, FACSM.

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The affects of combination progestin/estradiol hormones on women's vascular systems remain largely unidentified. Additionally, both the type and dose of synthetic hormones may differentially

impact cardiovascular risk. **PURPOSE:** To investigate brachial artery responses in two groups of women using two doses of combined monophasic levonorgestrel (LNG)/ethinyl estradiol (EE) oral contraceptives (OC). **METHODS:** We examined brachial artery peak responses during the active pill phase (AP) compared to the placebo pill phase (PP) of the OC cycle. Group A active pills contained 0.10 mg LNG/ 0.02 mg EE. Group B active pills contained 0.15 mg LNG/ 0.03 mg EE. In both Groups, placebo pills did not contain hormones. We tested the brachial artery using flow-mediated dilation (FMD) and nitroglycerin (NTG) to measure endothelium-dependent and endothelium-independent vasodilation, respectively. 15 women (18-26 yr) have completed the study, 8 in Group A and 7 in Group B. Subjects participated on two study days, once during the AP (days 5-7 of week 3) and once during PP (days 5-7 of week 4). Heart rate and blood pressure were continuously monitored while using high resolution Doppler ultrasound and automated wall tracking software to record brachial artery diameters, FMD, NTG dilation, blood flow, and shear rate. **RESULTS:** There was a difference in FMD in Group A between the AP and PP ($5.33 \pm 0.61\%$ vs $7.23 \pm 0.92\%$; $p = 0.024$) but not in Group B between the AP and PP ($8.00 \pm 0.97\%$ vs $7.61 \pm 1.07\%$; $p = 0.647$). There were no differences in baseline diameters or shear rate between the AP and PP in either group. Between groups, Group A had larger baseline diameters (3.49 ± 0.08 vs 3.11 ± 0.07 $p = 0.001$) and lower shear than Group B (4585.65 ± 487.45 vs 8040.12 ± 850.98 ; $p = 0.002$). There was no difference in NTG dilation between Groups or between AP and PP in either Group. **CONCLUSIONS:** These data suggest that exogenous hormones can change vascular responsiveness during an OC cycle, and this response may be dose dependent.

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Masters

PHYSIOLOGICAL COMPARISON OF YOUNGER AND OLDER TRAINED MALE SWIMMERS

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PURPOSE: To compare the metabolic and cardiovascular responses in 14 young (mean \pm SD, Y, 20.0 \pm 2.2 yr), 8 middle-aged (MA, 42.8 \pm 4.9 yr), and 9 older (O, 56.2 \pm 5.6 yr) trained male swimmers during freestyle swimming. **METHODS:** Expired air was collected via a snorkel apparatus (indirect calorimetry) during a series of submaximal and one incremental freestyle swim to exhaustion (max). Heart rate (HR, telemetry) was monitored, and a finger stick for blood lactate determination (BLa, YSI 1500 Sport Analyzer) was performed following each swim. Interpolation was employed to determine swimming velocity at a BLa of 4.0 mM (OBLA). Swimming velocities for the final 182.9 and 68.6 m of the max swim were used as swimming performance measures. The Y, MA, and O swimmers were compared on selected physiological parameters at a given metabolic power of 800 watts (W) and at 70% max oxygen uptake (VO_{2max}). **RESULTS:** Swimming performance for the final 182.9 and 68.6 m of the max swim declined with advancing age. VO_{2max} decreased with age with the greatest difference between MA and O (Y = 4.33 \pm 0.45; MA = 4.05 \pm 0.47; O = 3.29 \pm 0.39 $LO_2 \cdot min^{-1}$) ($P < 0.05$). The correlation coefficients (r) between VO_{2max} and velocity for the final 182.9 and 68.7 m of the max swim were 0.70 and 0.68, respectively ($P < 0.05$). Furthermore, HR_{max} of the O swimmers (163.0 \pm 12.2 bpm) was about 10 and 6% lower compared to Y (180.2 \pm 6.4 bpm) and MA (173.6 \pm 12.1 bpm), respectively ($P < 0.05$). Peak BLa was similar among age groups (Y = 9.86 \pm 2.17 mM; MA = 10.29 \pm 2.50; O = 9.53 \pm 2.40 mM). Swimming velocity and HR at a given submaximal metabolic power of 800 W were similar among age groups (\sim 0.96 $m \cdot s^{-1}$ and 129 bpm). Metabolic power corresponding to a relative intensity of 70% VO_{2max} was 1036 \pm 130, 940 \pm 125, and

801 \pm 91 W for Y, MA and O, respectively ($P < 0.05$). The corresponding swimming velocities for the latter metabolic power outputs were 1.12 \pm 0.11, 1.04 \pm 0.10 and 0.94 \pm 0.12 $m \cdot s^{-1}$, respectively ($P < 0.05$). For all groups, velocity at OBLA corresponded to the same relative physiological intensity (\sim 68% VO_{2max}); however, swimming velocity at OBLA was found to decrease with age (Y, 1.09 \pm 0.13; MA, 1.03 \pm 0.14; and O, 0.93 \pm 0.09 $m \cdot s^{-1}$) ($P < 0.05$). **CONCLUSION:** Age related decrements in swimming freestyle performance are not attributable to any changes in swimming economy. Rather, a decline in VO_{2max} appears to be the primary physiological parameter associated with a reduction in swimming performance with age. These findings also imply that to sustain a given velocity with advancing age, one would need to swim at a greater relative physiological intensity to generate the required mechanical power output.

INTERMITTENT SCHEDULED FEEDINGS INCREASE WORK OUTPUT DURING WILDFIRE SUPPRESSION.

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Our laboratory has previously demonstrated that liquid carbohydrate supplementation increases work output during wildfire suppression (Ruby et al., *Med Sci Sports Exerc* S219, 2004). **PURPOSE:** Determine the effect of two different eucaloric feeding strategies on work output (actigraphy) during wildfire suppression. **METHODS:** 29 Type I wildland firefighters (WLFF) from three different Hot Shot crews (26 M, 3 F) were studied at two different wildfires in the Northwest United States during the 2005 fire season. WLFF consumed either their traditional sack lunch (TRA) during the middle of their shift or snack foods throughout the day (SF) at 90-minute intervals following breakfast in a randomized cross-over design. The total energy intake during the 12-hour shifts was isocaloric (1534 \pm 265 kcals) between days. Work output was monitored using activity counts (MiniMitter, Bend, Oregon), rating of perceived exertion (RPE), and



overall satisfaction with each feeding strategy. RESULTS: The total daily activity counts was 6,629,023 and 7,130,373 for the TRA and the SF days, respectively ($p < 0.05$). Post breakfast/ pre-lunch counts were 3,266,583 and 3,624,945 for the TRA and SF days, respectively ($p < 0.05$). During the last 2 hours of the shift, activity counts were 1,347,790 and 1,900,720 for the TRA and SF days, respectively ($p < 0.05$). No statistically significant differences were found for RPE at any time during the work shift. Satisfaction was higher in favor of the SF approach to shift feeding in all categories (8 questions, $p < 0.05$). CONCLUSIONS: Despite no differences in RPE, the SF group performed more overall work (8%) than the TRA group, especially during hours 4-6 post lunch (41% more). Even when work shift total energy intake remains isocaloric, feeding at regular intervals increases self-selected work output during wildfire suppression.

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QUALITY OF LIFE IMPROVES IN EXERCISING BREAST CANCER SURVIVORS

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Breast cancer survivors often experience physical and psychological side effects resultant to their diagnosis and subsequent medical treatment. These side effects, which include decreased aerobic capacity, psychosocial impairment, poor body image, fatigue, weight gain, and depression, may negatively impact quality of life (QOL). Exercise has been shown to be an effective tool in reducing cancer related side effects and may furthermore promote enhanced physical and emotional well-being. If aerobic exercise can affect physical and emotional well-being, it may improve overall QOL. PURPOSE: The purpose of this study was to examine the effect of a low to moderate aerobic exercise program on quality of life in breast cancer survivors. METHODS: Twenty-two survivors of breast cancer (43-79 years of age, at least one month posttreatment) were

randomly assigned to either an exercise group ($n=12$) or a control group ($n=10$). The exercise group participated in a low to moderate intensity (30-50% heart rate reserve) aerobic exercise program three times a week for ten weeks. The control group did not participate in the exercise program. QOL was assessed with the Quality of Life Index for Patients with Cancer prior to and following the treatment period. This scale is composed of 14 items evaluating physical condition, normal activities, and personal attitudes on general quality of life. RESULTS: Statistical analysis revealed a significant improvement in QOL over time in the exercise group compared to the control group ($p=.001$). The exercise group increased QOL by 18% from pre to posttraining (76.0 \pm 5.00 to 90.0 \pm 3.21) while the control group decreased QOL by 4.7% (89.0 \pm 2.28 to 84.9 \pm 2.00). CONCLUSION: These results indicate that low to moderate intensity exercise is effective in improving quality of life in breast cancer survivors over a ten week training period. This relatively low dose-response relationship may help improve exercise adherence, general health, and well-being in this population. Breast cancer survivors should be encouraged to participate in low to moderate aerobic exercise programs.

METABOLIC AND CARDIOVASCULAR RESPONSES TO RUNNING ON SLOPING SURFACES.

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Investigations have examined the general physiological responses of running over various slopes; however, no research has been conducted studying the physiological responses of running on sloping surfaces in which talent level has been employed as an independent variable. PURPOSE: To investigate the metabolic and cardiovascular responses of running on sloping surfaces between two groups of distance runners who differ in their running ability. METHODS: Trained, male distance

runners were categorized into a fast (F, n=7) and slow (S, n=8) group based on their season cross-country performance times. Subjects first performed a 20 min. level run at 14.5 km·hr⁻¹ followed by an incremental maximal test to exhaustion. On a separate occasion, subjects completed a 20 min. sloping surfaces run (5 min. at 0, -5, 5, and 0% grade) at 14.5 km·hr⁻¹ followed by a self-paced 3 km trial consisting of downhill, uphill and level running. Open-circuit spirometry was employed to measure metabolic response for each run test while heart rate (HR) was monitored via telemetry. Net VO₂ values (run VO₂ – standing VO₂) are reported. RESULTS: VO_{2max} was greater for F (60.1) compared to S (54.4 ml·kg⁻¹·min⁻¹) (p<0.05), whereas both groups had a similar max HR (191 and 193 bpm, respectively). Both groups completed the 20 min. level run at a steady VO₂ of ~ 40-42 ml·kg⁻¹·min⁻¹; however, F accomplished the level run at a lower %VO_{2max} (68 vs.79) (p<0.05). HR was found to drift upward during the level run regardless of group, while F maintained an overall lower heart rate response (p<0.05). Both F and S had a similar steady-rate VO₂ during the first 5 min. (0% grade) of the sloping run test (39-40 ml·kg⁻¹·min⁻¹). Relative to the first 5 min. of level running, the % change in VO₂ for F and S was -24 and -20 for downhill, +40 and +32 for uphill, and +8 for both groups during the final 5 min. of level running with no difference observed between groups. In addition, throughout the sloping run test, F ran at a lower %VO_{2max} compared to S (p<0.05). Three km performance time for F was 629 compared to 749s for S (p<0.05). CONCLUSIONS: Regardless of running ability, at a given speed and grade (±5%), running uphill resulted in a more dramatic change in metabolic response than running downhill when compared to level running. From an energetic perspective, this finding suggests that during a race, an increase in speed during downhill running would not compensate for any decrease in speed encountered during uphill running. Furthermore, the faster runners distinguished themselves by running at a lower relative physiological effort compared to the slower group during level, downhill and uphill running.

CORE TEMPERATURE COMPARISON BASED ON TIME OF PILL INGESTION PRIOR TO EXERCISE.

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PURPOSE: The purpose of this study was to determine the effects of sensor ingestion on core temperature measurements during cool weather exercise. METHODS: Seven subjects (m=3, f=4) ran on a 400 meter outdoor dirt track for 45 minutes at a predetermined pace (70% VO₂ max) during four exercise trials. Thirty to forty-five minutes prior to each exercise trial subjects ingested one core temperature pill (P1). Over the four trials for each subject there were 15 sessions where subjects retained their pill from the previous trial (P2). Core temperature was recorded every minute with a capsule recorder (MiniMitter, Bend, Oregon) in conjunction with a Vital Sense monitor (MiniMitter, Bend, Oregon). Temperatures were averaged at five minute intervals. Significance was set at the .05 level. RESULTS: There was a statistical difference between P1 and P2 pills during the start temperature (37.9±0.04 P1 and 37.9±0.04 P2) and the first five minutes of exercise (37.9±0.04 P1 and 38.07±0.04 P2), (p<.05). During the remainder of the exercise trial (40 minutes) there was no statistical difference between P1 and P2 pills on core temperature readings (p>.05). CONCLUSION: During the majority of the exercise there was no difference in core temperature values based on the time that the core sensor was ingested. However, early difference may suggest that ingestion of the sensor should be standardized, especially for shorter periods of work.

Supported by: Saucony/Hind.

EFFECT OF STORAGE TECHNIQUES ON BLOOD LACTATE CONCENTRATION AND DETERMINATION OF VARIOUS LACTATE THRESHOLD DEFINITIONS

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Blood is often used to determine various hemodynamic parameters during exercise testing. Periodically, analysis of blood samples occurs post testing and there is some speculation that storage techniques may alter the values obtained. Additionally, no set guidelines or standardization methods exist for measuring blood lactate. Purpose: The purpose of this study was to investigate the effect of storage on lactate concentration in whole blood samples and to determine the influence of storage in the determination of various definitions of the lactate threshold (LT). Methods: Six trained competitive cyclists (age: 25.8 ± 6.0 yrs; height: 179.2 ± 4.8 cm; weight: 80.4 ± 7.9 kg; body fat $11.0 \pm 5.3\%$; $VO_{2\text{max}}$: 57.8 ± 4.4 ml·kg⁻¹·min⁻¹) completed a single continuous incremental maximal test to determine their individual lactate profile. During the maximal testing, oxygen consumption and blood lactate were measured. Blood samples were collected at rest, post warm-up, at the conclusion of each completed exercise stage, and at maximal exercise via a venous catheter inserted in an antecubital vein. Each blood sample drawn was placed in vials containing either potassium oxalate (PO) or lysing agent. Samples were analyzed immediately posttest and again after storage intervals of 72 hours, 1 week, and 4 weeks. A two-way ANOVA with repeated measures (storage X stages) was used to determine differences among testing dates during each stage of the maximal test. A one-way ANOVA was used to determine statistical differences between test vials at each LT definition. Results: Blood lactate concentration was significantly increased with exercise intensity. There was no storage effect for lysed blood at any storage interval for any stage ($P > 0.05$). Differences were observed for the lactate values stored with PO at rest, pre-exercise, and stage 1 at all storage intervals ($P < 0.05$), however, no differences were observed at any other cycling stages. The exercise intensities associated with the various LT definitions (breakpoint, 1mM above baseline, 2.5 mM, 4.0 mM, Dmax method, and log-log transformation model) were not significantly different over time ($P > 0.05$). Conclusion: Despite significant differences in lactate values from rest, pre-exercise, and stage 1 for the PO, the results indicate

that blood samples treated with either potassium oxalate or lysing agent may be stored for up to 4 weeks without affecting the determination of various lactate threshold definitions.

EFFECTIVENESS OF REP REEBOK ON MUSCULAR STRENGTH, MUSCULAR ENDURANCE AND BODY COMPOSITION IN HEALTHY ADULTS

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The fitness industry is continuing to evolve, as participants demand new, innovative ways to build or maintain the components of fitness. Group exercise is one of the most popular ways to provide programs and many of the companies at the forefront of the industry market themselves as research-based but little published data supports that claim. PURPOSE: This study was designed to investigate whether the Rep Reebok group exercise, resistance-training program taught by a certified instructor was effective in gaining muscular strength, muscular endurance, and impacting body composition in healthy, trained adults, ages 25-55. METHODS: Twenty-five active members (17 = female; 8 = male) of 24Hour Fitness completed the study. Following pre-testing for 1RM chest press and leg press, the YMCA submaximal muscular endurance test for chest press and leg press and body composition using skinfolds, they all participated in the Rep Reebok program two to three times per week for six weeks. Rep Reebok is a 55-60 minute class intended to provide a full-body workout using dumbbells and barbells with weight plates in a group setting providing class camaraderie and valuable instruction by a knowledgeable exercise leader. All participants were post-tested on the same variables within one week of the end of the class. A student's t-test was used to compare pre- and post-test values for individual variables. RESULTS: The group experienced significant improvements in all variables: upper body muscle strength ($t = -3.19$; $p = .004$), lower body muscle strength ($t = -4.30$; $p = .0001$), upper body muscular endurance ($t = -4.68$; $p = .0001$), lower body muscular endurance ($t = 3.49$; $p = .002$), and body composition ($t = 3.483$;

p=.002). CONCLUSION: These results suggest that previously trained adults who regularly participate in Rep Reebok at least two times per week will demonstrate physiological adaptations to resistance training within six weeks.

MUSCLE GLYCOGENOLYSIS AND RESYNTHESIS IN RESPONSE TO A HALF IRONMAN TRIATHLON: A CASE STUDY

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PURPOSE: The purpose of the study was to describe the degree of muscle glycogen depletion and resynthesis in response to a half Ironman triathlon. METHODS: One male subject (38 yr.) completed the Grand Columbian half Ironman triathlon (1.9 km swim, 90 km bike, 21.1 km run). Three muscle biopsies were obtained from the subject's right vastus lateralis (pre-race, immediately post-race, and four hours post-race). Pre and post-race body weight was recorded, in addition to macronutrient consumption before, during, and after the race. Energy expenditure and whole body substrate oxidation was estimated from linear regression established from laboratory trials (watts and run pace relative to VO_2 and VCO_2). RESULTS: Overall finish time for the race was 4:48:53 (33:33 swim, 2:43:11 bike, 1:28:40 run). The average exercise intensity for each segment of the race were (Bike = 230 watts, 68% VO_2 peak, 110% VT; Run = 14.2km/hr, 70% VO_2 peak, 101% VT). Body weight decreased 3.8 kg from pre to post-race. Estimated energy expenditure for the bike segment was 2,715 kcal (2389 and 326 kcals for CHO and Fat, respectively) and 1,592 kcal (1378 and 214 kcals for CHO and Fat, respectively) for the run segment of the race. A total of 307.97g CHO (liquid and gel) was consumed (1.21 g CHO/min). Muscle glycogen decreased from 227.1 pre-race to 38.6 mmol/kg wet wt. post-race. During the 4 hours post-race, a mixed diet was consumed (471g CHO, 15g Fat, 64 Protein) which included scheduled liquid CHO sources (Gatorade energy drink) and a meal. The calculated rates of muscle glycogen resynthesis

was 4.1 mmol/kg wet wt./hr. CONCLUSION: The completion of a half Ironman triathlon is dependent on a high rate of muscle glycogenolysis, which demonstrates the importance of exogenous carbohydrate intake during the race. In addition, rates of muscle glycogen resynthesis may be dampened by the eccentric damage resulting from the run portion of the race.

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EFFECTS OF CARBOHYDRATE SUPPLEMENTATION IN MEN AND WOMEN DURING LONG DURATION EXERCISE.

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Previous research has demonstrated conflicting results regarding a gender difference in substrate utilization during exercise. PURPOSE: This study evaluated the effects of CHO supplementation on whole body and muscle substrate utilization during prolonged, discontinuous exercise in men and women. METHODOLOGY: Thirteen recreationally trained subjects (n=7 males, n=6 females, during the follicular phase) performed a GXT on a treadmill (TM) and electronically braked cycle ergometer to determine ventilatory threshold (VT) and VO_{2peak} . In a double blind, random crossover design, subjects received either a CHO [20% maltodextrin (0.6g/kg FFM/hr)] or flavored placebo (PLA) drink each hour. TM exercise was performed at $44\pm4\%$ VO_{2peak} and $71\pm3\%$ VT. Cycle ergometer exercise was performed at $42\pm1\%$ VO_{2peak} and $72\pm4\%$ VT. Hourly exercise included 9 minutes on an upper body ergometer, 19 minutes on the cycle ergometer, and 20 minutes on the treadmill, followed by a 10-minute rest and feeding period. A standardized breakfast and lunch (5 g/kg BW CHO, and 1.2 g/kg BW PRO) were provided for both trials. Muscle biopsies of the vastus lateralis were performed pre- and post-exercise, and expired gases were collected every other hour during the TM segment of the trial. Blood glucose (BG) was measured continuously



using an indwelling glucose sensor, and total urine void was collected. RESULTS: Using a three-way ANOVA (gender*trial*time) there was no significant interaction in whole body and muscle substrate utilization. A main effect was seen for time in CHO oxidation (137.8 ± 13 , 129.9 ± 18 and 108.0 ± 17 , 86.2 ± 18 $\mu\text{mol/kg FFM/min}$ for CHO and PLA respectively, $p=0.0001$), fat oxidation (4.5 ± 1 , 5.3 ± 2 and 7.1 ± 2 , 9.0 ± 2 $\mu\text{mol/kg FFM/min}$ for CHO and PLA respectively, $p=0.0001$), and blood glucose (133.3 ± 27 , 108.29 ± 28 and 128.8 ± 31 , 99.9 ± 25 mg/dL for CHO and PLA respectively, $p=0.0001$). A main effect was also demonstrated for trial in muscle glycogenolysis rate (3.4 ± 2 and 6.1 ± 2 mmol/kg wet wt/hr for CHO and PLA respectively, $p=0.0064$). CONCLUSION: Ingestion of CHO during long duration, low intensity exercise appears to have no gender specific effect on whole body substrate utilization. Although CHO ingestion decreases muscle glycogenolysis there is no gender specific effect.

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EFFECTIVENESS OF STIFF INSOLES ON SPRINTING PERFORMANCE

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During foot contact in sprinting, the small bones of the foot undergo considerable deformation. The amount of force the foot produces during push-off is important for determining performance time. Recent investigations have suggested that experimentally increasing the stiffness of the shoe insole may lead to improved performance, perhaps by increasing the amount of force transferred from the foot to the track. PURPOSE: The purpose of this study was to investigate the effect of increased insole stiffness on sprint performance in a small group of collegiate track and field sprinters. METHODS: Following a familiarization period, eight sprinters performed two maximal effort 40 meter sprints on each of three days using either their regular sprint shoes, or with the addition of a medium or high stiffness insole. Infrared timing gates mounted on tripods were spaced every 8 meters along the track, beginning one

meter forward of the start line. RESULTS: A one-sample t-test performed on difference scores failed to reveal a significant improvement using either experimental insole condition ($p=0.41$). On average, performance was improved 1% using an insole and this effect was greatest for females. Although average improvement was not statistically significant, it may have practical significance for performance outcomes (Hopkins et al., 1999). This study was limited in its control over concurrent training and its small subject number. Future studies should utilize a larger sample and investigate individual factors that may influence performance change with insoles such as strength, power, and training level.

EFFECTS OF JACKET DESIGN ON PHYSIOLOGICAL AND PERCEPTUAL CHANGES DURING COOL WEATHER RUNNING

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PURPOSE: The purpose of this study was to investigate differences in skin temperature, core temperature, heart rate, and ratings of perceived exertion (RPE) of recreational runners wearing four different cool weather running jackets during moderate intensity exercise. METHODS: Eight recreational runners ($n=4$ males, $n=4$ females) completed four, forty-five minute running sessions over a period of one week on an outdoor dirt track with four jackets of different weights (jacket 1-7.9 oz., jacket 2-13.2 oz., jacket 3-10.6 oz., jacket 4-17.6 oz.). Approximately 45 minutes prior to each session subjects ingested a small VitalSense disposable telemetric sensor (Jonah capsule) and 50 ml of cool water. Following ingestion subjects changed into standardized clothing, and were fitted with polar telemetric heart rate monitors and skin temperature sensor patches. Subjects ran for 45 minutes at approximately 70% peak VO_2 with an average ambient temperature of 3.4°C and average relative humidity of 74%. During the run, skin and core temperatures and heart rate were

recorded every minute and RPE every five minutes. RESULTS: There were no statistically significant differences between the four exercise trials for heart rate (162±7, 160±6, 158±5, 160±6 bpm for jackets 1, 2, 3, and 4, respectively), skin temperature (30.8±1.8, 30.2±1.7, 29.0±2.4, 29.7±1.9 °C for jackets 1, 2, 3, and 4, respectively), and core temperature (38.4±0.5, 38.2±0.5, 38.3±0.4, 38.3±0.4 °C for jackets 1, 2, 3, and 4, respectively). However, there was a statistically significant difference in the average RPE between jacket 1 (11.8±2.1) and jackets 2 (12.3±2.0) and 4 (12.4±2.3), p<0.05. CONCLUSIONS: During cool weather running, jacket design and weight has minimal effects on measures of heart rate, skin and core temperature. However, the data suggests that lighter fabric design may lower ratings of perceived exertion at a given intensity during cold weather running.

Supported by: Saucony/Hind

METABOLIC CHANGES ASSOCIATED WITH EXERCISE TRAINING IN CANCER SURVIVORS

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Cancer survivors often experience fatigue and physiological de-conditioning as a result of medical treatment and decreased physical activity. This physical decline can reduce the ability to conduct daily tasks of independent living and may negatively affect overall quality of life. Aerobic exercise programs may reverse physiological de-conditioning by increasing aerobic capacity, lowering relative metabolic load, and reducing heart rate and perception of effort for a given workload. PURPOSE: The purpose of this study was to examine the impact of an aerobic exercise program on metabolic, cardiovascular, and perceptual load in cancer survivors. METHODS: Sixteen survivors of breast, colon, or lung cancer (14 female and 2 male, 43-73 years of age) served as subjects. Subjects participated in a ten-week low to moderate intensity (30-60% heart rate reserve) aerobic exercise program for 14-20 minutes a session, three times a week. A graded exercise treadmill test was administered pre and posttraining period. During this test, heart

rate, ratings of perceived exertion (RPE) and oxygen consumption were recorded every two minutes. RESULTS: A 12% increase in VO_{2max} was observed from pre (19.2 ml/kg/min) to posttraining status (21.6 ml/kg/min) (p < 0.05). Posttraining heart rate and RPE were lower during all stages when compared to pretraining values (p < 0.05). Relative metabolic load (%VO_{2max}) was lower at all stages of posttraining testing when compared to pretraining measures (p < 0.05).

Time	Stage 1	Stage 2	Stage 3	Stage 4
% VO2max Pre	55	70	76	83
% VO2max Post	49	61	68	76

CONCLUSION: The ability to complete basic tasks taken for granted by a healthy population can strongly affect quality of life in cancer survivors. This study found an aerobic exercise program to lower relative energy expenditure, heart rate and RPE for a given workload. Decreases in relative effort may increase one's ability to perform basic tasks, and consequently increase quality of life. These results encourage the use of aerobic exercise in the rehabilitation of cancer survivors.

LIGHT EXERCISE DOES NOT AMELIORATE DOMS SYMPTOMS BEYOND THAT ACHIEVED BY REST.

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Enhanced blood flow and elevated temperature associated with light intensity, low or no impact exercise may reduce symptoms associated with delayed-onset muscle soreness (DOMS). PURPOSE: The purpose of this study was to determine whether cycling and deep-water running as recovery exercises affect the severity of DOMS symptoms and biomarkers following downhill running. METHODS: Twenty-five healthy males completed a 25-min downhill (DH) run (-11%) and were assigned to rest (R; n=9), deep-water running (W; n=9), or cycling (C; n=7) for the 96-h recovery period. W and C subjects performed 20 min of light exercise (RPE 10-12) following the DH run and on each day of recovery. Soreness was reported using scales



ranging from 0 (no pain) to 6 (unbearably painful). Active and passive muscle soreness and creatine kinase (CK) activity were measured prior to DH running and every 24 h during recovery. Soreness during active movement (step up/down on 40 cm bench) was measured prior to and immediately following each recovery exercise session. **RESULTS:** Active and passive measures of muscle soreness for the lower limbs were elevated following the run ($P<0.0001$); however, no differences existed among the recovery groups ($P=0.48$) nor were any group-time interactions observed ($P=0.91$). Passive soreness peaked between 24 and 48 h (Mean \pm SE: R 3.89 ± 0.46 , W 4.0 ± 0.29 , C 3.14 ± 0.67) for all recovery groups. Similarly, CK was elevated (208% above baseline at 24 h) following DH running ($P<0.0001$), but the responses were not different among groups. Water running resulted in a temporary 21% decrease in active muscle soreness immediately post water exercise at both 48 and 72 h ($P<0.01$); however, this relief was not observed following cycling exercise. **CONCLUSION:** These results suggest that deep-water running merely provides transient relief in muscle soreness and that light water running and cycling exercise do not facilitate overall recovery from DOMS symptoms beyond that achieved by rest. Furthermore, the inclusion of deep-water running or light cycling exercise does not appear to be detrimental to recovery from DOMS.

GPS-BASED PREDICTION OF ENERGY EXPENDITURE FOR SLOW AND FAST OUTDOOR WALKING

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GPS monitors may prove to be an invaluable tool for investigations for Free-Living Activities but first need to be assessed as valid research instruments. **PURPOSE:** The purpose of this study was to determine the accuracy of GPS monitors for estimating energy expenditure (EE) for slow and fast outdoor walking and to evaluate differences in the predictive ability of waist and wrist-worn GPS monitors. **METHODS:** Thirteen subjects (28.4 ± 2.8 yrs, 67.2 ± 12.2 kg, 171.7 ± 9.4 cm) volunteered

to complete a 2.4 km course at self-selected slow and fast walking paces. The course started at 1500m and featured 60 m elevation gain and 60 m elevation loss. The course distance was measured using a calibrated measuring wheel. Heart rate was monitored to identify intensity for each pace, insure constant intensity at each pace, and verify a distinction between fast and slow paces for each subject. Each subject carried two WAAS-Enabled GPS monitors, one wrist-worn and one waist-worn, as well as a portable metabolic unit to measure EE (total mass = 2.35 kg). GPS accuracy was reported as 5 – 10m for all trials. Time for each trial was measured using a stopwatch. Equations were used to estimate the energy cost of walking from speed and grade (Minetti, 2002), as well as the energy cost of wind resistance (Pugh, 1970) to calculate the total EE (EE_{GPS}) for walking. Metabolic data collected was converted from VO_2 and VCO_2 into Kcals using the equation by Weir (1949). Comparisons between EE and EE_{GPS} were made using repeated measures ANOVA. **RESULTS:** Prior to data analysis, two outliers were removed due to exceedingly large values for EE_{GPS} : EE_{GPS} (130.4 ± 15.4 Kcals) and EE (107.4 ± 25.8 Kcals) were significantly different ($p<0.01$) when both GPS monitors and speeds were considered. There was no significant difference between the two GPS monitors for predicting total EE (128.6 ± 24.3 and 132.3 ± 26.9 Kcals for wrist and waist-worn, respectively; $p=0.20$), EE during fast walking (124.7 ± 22.1 ; $p=0.11$), or EE during slow walking (132.9 ± 26.7 ; $p=0.41$). Using only waist-worn GPS data, EE_{GPS} (132.87 ± 26.7 Kcals) and EE (101.7 ± 25.3 Kcals) were significantly different ($p<0.01$) for slow walking, but not for fast walking ($EE_{GPS} = 124.7\pm 22.1$ Kcals, EE = 113.7 ± 26.2 Kcals; $p=0.09$). **CONCLUSIONS:** The WAAS-enabled GPS monitors significantly over-predicted EE except when the analysis was limited to fast-paced walking. GPS monitor placement should not be a concern for future studies, as both the wrist and waist-worn GPS monitors provided similar estimates for EE across all conditions. Due to variance in the GPS signal, GPS monitors appear better suited to estimate EE for fast walking (or possibly running), rather than slow walking.

PHYSIOLOGICAL AND METABOLIC RESPONSES DURING TWO SELF-SELECTED CYCLING TIME TRIALS

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The lactate threshold (LT) has been used extensively to predict performance, prescribe exercise intensity, and monitor training adaptations. The LT is usually determined by using an incremental exercise protocol. However, during prolonged exercise, physiological and metabolic responses are not always the same as predicted from an incremental protocol. PURPOSE: The purpose of this study was to investigate physiological and metabolic responses during two self-selected time trials (TT) and to compare these responses to three lactate threshold definitions (1.0 mmol above resting blood lactate concentration; LT_{b+1} , fixed blood lactate of 4.0 mmol; $LT_{4.0}$ and Dmax method; LT_{Dmax}). METHODS: Five trained, competitive cyclists (age: 23.8 ± 3.8 yrs; height: 180.5 ± 4.1 cm; weight: 80.8 ± 8.8 kg; body fat: 10.4 ± 5.6 %; $\dot{V}O_{2max}$: 58.1 ± 4.9 ml·kg⁻¹·min⁻¹) participated in this study. Each subject completed three testing protocols, which were separated by a minimum of 1 week. The first test consisted of an incremental maximal exercise test on a cycle ergometer. On two separate occasions, a self paced 20 kilometer (k) and a 40k TT was completed. During these trials, power output (PO), heart rate (HR), and blood lactate (LA) responses were measured. Blood samples were collected through a venous catheter placed in an antecubital vein to determine lactate responses. A dependent t-test was used to determine statistical difference for the mean power output, LA, and HR response between the two TT. In addition, a one-way ANOVA was used to compare the responses corresponding to the three lactate threshold definitions and the responses during the two TT. RESULTS: The mean lactate concentration during the 20k TT (6.22 ± 1.4 mmol) was significantly higher than the mean lactate concentration during the 40k (3.86 ± 1.0 mmol). Power output ($p=0.03$) and HR ($p=0.0002$) were significantly higher during the

20k compared to the 40k TT. Mean LA concentration during the 20k was significantly higher than those at the three LT definitions. Power output during the 20k was only significantly different from the $LT_{4.0}$ whereas HR was significantly different from the LT_{b+1} and LT_{Dmax} . During the 40k, mean PO was significantly higher than the LT_{b+1} and LT_{Dmax} , but not for the $LT_{4.0}$. Finally, HR response during the 40k was significantly different from the LT_{b+1} . CONCLUSION: These results indicate that responses at different lactate thresholds may not be representative of responses during two different self-selected time trials.

THE ACUTE EFFECTS OF VARIOUS WEIGHTED BAT WARM-UP PROTOCOLS ON BASEBALL BAT VELOCITY

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The popular use of weighted bats prior to hitting a baseball is predicated on the "kinesthetic illusion" of perceived faster swing velocity with the standard bat. This concept is also supported by the strength training practice of complex training. Heavy resistance exercises alternated with lighter, more explosive exercises has provided evidence of increased power. However, the optimal order of weighted bat warm-up on subsequent baseball bat velocity has not been identified. PURPOSE: The purpose of this study was to determine the optimal order of various weighted bat warm-up protocols to enhance bat velocity in collegiate baseball players. METHODS: Twenty collegiate baseball players (age = 20.2 ± 1.5 yr) were tested for upper body strength (3-RM bench press, 97.98 ± 14.54 kg). Nine weighted bat warm-up protocols, utilizing three weighted bats (light=795 g; standard=852 g; heavy=1,534 g) were swung six times each in different orders. Standard bat velocity was measured prior to and immediately following each warm-up protocol. Control testing involved a warm-up protocol only with the standard bat. RESULTS: Pearson product correlation revealed a significant relationship between strength and pre-test bat velocity ($r=0.57$, $p<0.05$). Repeated measures



ANOVA revealed no significant treatment effects of warm-up protocol on bat velocity. However, the protocol that followed an order of standard, light, and heavy resulted in the highest bat velocity (29.73 ± 1.3 m/sec) compared to the control protocol (27.24 ± 1.4 m/sec) for an absolute increase of 9%. CONCLUSION: While the results indicated no significant post-test effects, the order of heavy, light, and standard weighted bats resulted in the greatest increase in bat velocity. This order may facilitate motor unit recruitment and could prove to be quite beneficial in an applied setting.

EFFECTS OF EXTENDED EXERCISE AND CARBOHYDRATE FEEDINGS ON SUBSTRATE UTILIZATION AND MUSCLE GLYCOGENOLYSIS
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The effects of carbohydrate feeding during physical activity lasting less than four hours are well established. However, it cannot be assumed that the metabolic responses are similar during exercise performed longer than four hours. PURPOSE: The purpose of this study was to examine the effects of exogenous carbohydrate intake during prolonged exercise on muscle glycogenolysis and whole body substrate oxidation. METHODS: Nine recreationally-trained male subjects participated in two 8-hour exercise trials. Diet and activity were controlled the day before each trial. A muscle biopsy was obtained from the vastus lateralis at approximately 0645. Subjects were then provided with a standardized breakfast. Exercise on the cycle ergometer started at 0800 and consisted of two steady state (70%Tvent) and three interval (110-90%Tvent) work bouts for 25 minutes. This was followed by a 5-minute rest period. Subjects then completed two steady state (70%Tvent) and three interval (110-90%Tvent) work bouts on a treadmill for 25 minutes. This was followed by a 5-minute rest period. This schedule was repeated for hours 1-4 and again for hours 5-8. Every 15-minutes, subjects ingested 150 mL of either a 10% carbohydrate solution (CHO) or a sweetened placebo (PLA). Between hours 4 and 5 subjects

rested for 35 minutes and ate a standardized lunch. Metabolic gases were collected during both modes of exercise during the last seven minutes of hours 1, 4, 5, and 8. Blood samples were obtained from an anti-cubital vein pre-exercise, after hour 4 and immediately post-exercise. Upon completion of the eight exercise periods, a post-exercise muscle biopsy was obtained from the same leg (approximately 1cm proximal to the pre-exercise biopsy). Data were analyzed using repeated-measures ANOVA and statistical significance was set at $p < 0.05$. RESULTS: There was a significant difference in the degree of muscle glycogenolysis between trials (80.7 ± 21.8 and 112.62 ± 35.32 $\mu\text{mol/kg}$ wet wt. for the CHO and PLA trials, respectively). Blood glucose remained significantly higher during the CHO trial after hour 4 and post exercise (CHO= 3.2 ± 0.5 , 3.6 ± 0.4 , 3.8 ± 0.4 , PLA= 3.2 ± 0.4 , 3.2 ± 0.3 , 2.7 ± 0.4 mmol for pre, mid and post exercise). Rates of whole body carbohydrate oxidation demonstrated a general maintenance for the CHO trial. However, rates of whole body carbohydrate oxidation showed a statistically significant decline compared to hour 1 for the PLA trial. CONCLUSION: The results from this study suggest that regular exogenous carbohydrate feedings during prolonged, intermittent exercise attenuates muscle glycogenolysis while better maintaining rates of whole body carbohydrate oxidation.

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DOES CARBOHYDRATE INGESTION AFFECT CYCLING ECONOMY AND EFFICIENCY DURING 8 H OF PROLONGED EXERCISE?

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Ingesting a carbohydrate (CHO) solution during prolonged submaximal exercise appears to delay the onset of fatigue and enhance endurance performance, especially in exercise lasting more than 2 hours. However, whether CHO feeding affects cycling economy and efficiency during extended-duration exercise remains to be elucidated. PURPOSE: The

purpose of this study was to determine the effects of CHO ingestion (10%CHO solution: 60 g·h⁻¹) on cycling economy and gross efficiency during 8 h of prolonged exercise. **METHODS:** Seven moderately trained individuals [cycling %VO₂peak at ventilatory threshold (Tvent); 63.8±7.1] served as subjects. All subjects randomly completed a placebo-controlled, double-blind, crossover-design. Each subject performed a total of 8 h of exercise including 25 min of leg cycling (freely chosen crank rate; average from 72 to 85 rpm) and 25 min of treadmill walking with 5 min of transition between modes each hour and a 30 min lunch rest period. Each exercise session consisted of a variety of intensities (min 0-6=70%Tvent, min 7-8=110%Tvent, min 9=70%Tvent, min 10-11=100%Tvent, min 12=70%Tvent, min 13-14=90%Tvent, min 15-25=70%Tvent). Cycling economy (w·l⁻¹·min⁻¹) and gross efficiency (%) were determined during 70% Tvent from min 18 to 25 during hours 1, 4, 5, and 8. **RESULTS:** With a two-way repeated measures ANOVA, the main effect for trial for economy and gross efficiency and interaction (trial x time) were not statistically significant. However, the main effect for time demonstrated significant decreases at hour 8 compared to hour 4 in both economy (p<0.01) and gross efficiency (p<0.05). **CONCLUSION:** These findings suggest that carbohydrate ingestion during 8 h of endurance exercise appears to have no influence on cycling economy and gross efficiency at relatively moderate intensity with freely chosen crank rate.

COMPARING MEASURES OF FREE-LIVING PHYSICAL ACTIVITY USING THREE ACTIVITY MONITORS

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Electronic activity monitors can be used to measure the energy expended during physical activity (activity energy expenditure; AEE, kcals), as well as the time spent performing moderate to vigorous intensity activities (MV, mins). **PURPOSE:** To compare the estimated values of AEE and MV between three commercial activity monitors during

one day of free-living monitoring. **METHODS:** Three activity monitors were worn for a minimum of 10 hours (e.g., 08:00-18:00 hrs) by 9 subjects (Mean±SD: 26.2±7.4 yrs, 78.2±13.1 kg, 24.22±2.64 BMI). Once monitoring began, subjects performed their usual free-living activities except those that required removal of the monitors (e.g., showering). To ensure that some moderate intensity activity was included, subjects were instructed to perform two separate walking bouts of at least ten consecutive minutes anytime during the day. The monitors tested were an omnidirectional accelerometer (AC), a uniaxial accelerometer-based pedometer (LC), and a multi-channel monitoring system (ID). The AC monitor was worn on the right belt line dorsal to the iliac crest while the LC monitor was worn on the right belt line ventral to the iliac crest. The ID monitor consisted of three ECG leads and five pressure/position sensing electrodes placed on the sternum, mid-thigh, and the plantar surface of each foot. A data logger for the ID monitor was worn on the left belt line ventral to the iliac crest. The ID monitor has been validated extensively against indirect and room calorimetry measures of energy expenditure and was used in the present study as the criterion measure of free-living AEE. Measures of AEE and MV were derived from each monitor and compared using Pearson-product correlations, a multivariate one-way RM ANOVA, and Sheffe's post-hoc at the 0.05 alpha level. **RESULTS:** AEE for the ID monitor was significantly higher than the LC monitor (Mean±SE: 571.1±29.8 vs. 287.4±20.7 kcals; p<0.05) but did not differ from the AC monitor (508.6±44.0 kcals). MV for the ID monitor was significantly lower than the AC monitor (52.4±5.7 vs. 94.2±8.8 mins; p<0.05) but did not differ from the LC monitor (53.5±5.3 mins). Correlations of AEE between ID and LC (r=.2140, p=.5803), as well as ID and AC (r=.2416, p=.5310), were generally low and not significant. Correlations of MV between ID and LC (r=.5259, p=.1459), as well as ID and AC (r=.2793, p=.4666), were also generally low and not significant. **CONCLUSION:** These results suggest that different electronic activity monitors can provide very different conclusions about AEE and MV measures



during free-living physical activity. Clinicians and researchers need to be wary of these limitations when using a single monitoring device.

THE EFFECTS OF GLUCOSE CONSUMPTION AND 8 HOURS OF SUBMAXIMAL EXERCISE ON HEART RATE VARIABILITY IN TRAINED MALES
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PURPOSE: The purpose of this study was to determine the effects of consuming a glucose beverage on heart rate variability (HRV) measures in trained males across 8 hours of submaximal exercise. **METHODS:** Subjects (n=8) completed two 8-hour bouts of exercise (Carbohydrate (CHO), placebo) alternating between 25-minute portions of cycling and treadmill walking with 5-minute rest periods. During each 25-minute interval, subjects exercised at varying moderate to hard workloads that were based on ventilatory threshold. For the CHO trial, 15 g of CHO in a 10% solution glucose beverage was provided every 15 minutes. Supine 4-minute HRV measurements were collected pre and post-exercise. Measurements included standard deviation of R-R interval (SDNN), low frequency (LF), and high frequency (HF). Data were collected with a Polar S-810i heart rate monitor and analyzed with Fourier Transform software. A 2-way, within subjects, repeated measures ANOVA was used for statistical analysis to assess effects of time and feeding strategy. **RESULTS:** Overall, SDNN was lower post-exercise (pre=69.94 versus post=47.39, $p<0.05$). No significant main effect changes occurred in LF or HF measurements. There was no treatment (CHO versus placebo) effect for any HRV measurement. **CONCLUSIONS:** These data demonstrate that 8 hours of exercise decreases SDNN, showing a decreased overall variability in heart rate, but this variability was not identified as specifically LF or HF. Consumption of a 12% solution glucose beverage throughout an 8-hour exercise regimen of cycling and treadmill walking does not affect any heart rate variability measurements.

Undergraduate

DETERMINING CORONARY HEART DISEASE RISK FACTORS USING ACCELEROMETRY

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INTRODUCTION: The relationship between individual risk factors and physical activity (PA) has been studied extensively. However the optimal intensity, frequency and duration of PA that best reduce the risk for CHD remains unclear. Accelerometry may provide an inexpensive and easy tool to help answer these questions. **PURPOSE:** To evaluate the relationships between PA measured by accelerometry combined to a CHD risk ratio (CHD-RR) calculated from individual risk factors. **METHODS:** 132 subjects, equally distributed in gender and ages (18-65), were evaluated for CHD risk factors and wore actical® activity monitors for a 7 day period. A risk ratio was developed using: waist:hip ratio, blood triglycerides, diastolic blood pressure, high density lipoproteins, low density lipoproteins, HBA1C, percent body fat, and fitness [VO_2 at ventilatory threshold ($ml \cdot kg^{-1} \cdot min^{-1}$)]. For each risk factor, each individual received a ratio (0-1) relative to their status within the range of the study population. The eight risk factors ratios were averaged to create the CHD-RR. A large number of methods evaluating actical® activity counts were related to the risk ratio. The best individual correlation was with the average of the individual highest 10 minutes of daily activity counts (DAC) across seven days. A multiple regression was developed to predict the CHD-RR from AC and descriptive data. **RESULTS:** The correlation of CHD-RR with VO_{2vt} was $= -0.68275$ ($p<0.001$). The best multiple regression ($R= 0.7698$, $p<0.001$) to predict CHD-RR was: $CHD-RR = (age \cdot 0.001692) + (gender^1 \cdot 0.027444) - (height (cm) \cdot 0.389091) + (weight (kg) \cdot 0.004196) - (DAC \cdot 0.000003) + 0.729747$. **CONCLUSION:** Of greatest interest from this analysis is that the average highest individual 10

minutes of activity during a day appeared to be the most predictive PA variable affecting risk factors for CHD and that this variable, after accounting for descriptive variables, accounts for nearly 50% of the variance in CHD risk.

¹ Gender: (male = 1, female = 2)

USE OF ACCELEROMETRY AND PHYSICAL DESCRIPTORS TO PREDICT VENTILATORY THRESHOLD

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Ventilatory threshold (VT) has been shown to be an excellent marker of physical fitness. Additionally, VT has been shown to discriminate healthy individuals from individuals at risk for coronary heart disease. However, the prediction of VT has to date been difficult to accomplish without laboratory measurement. **PURPOSE:** The purpose of this study was to examine whether accelerometer activity counts and physical descriptors can be used to reliably estimate ventilatory threshold. **METHODS:** Adult male and female subjects of varying fitness and age (N=103, age range=18-65) wore accelerometers over a 7-d period of typical activity. Skinfold and anthropometric measures were collected and BMI was calculated. Subjects were all apparently healthy. Determination of VT was accomplished using metabolic testing on a treadmill using methods developed by Gaskill et al. Multiple methods to evaluate activity counts were developed and individually correlated to VT. Multiple regression analysis was then used to create a model to estimate VT. **RESULTS:** The best activity count correlate to VT was the average of the individual highest 10 minutes of daily activity counts (DAC) across seven days ($r=0.394$, $p<0.001$). The best multiple regression model to estimate VT was calculated as $VT (ml \cdot kg^{-1} \cdot min^{-1}) = (DAC * 0.000305) - (age \cdot 0.099596) - (gender^1 \cdot 5.785378) - (BMI \cdot 0.566551) + 51.3$, ($R=0.676$, $p<0.01$, std err est = $5.45 ml \cdot kg^{-1} \cdot min^{-1}$). **CONCLUSION:** Ventilatory threshold can be reasonably predicted using accelerometry and descriptive data, accounting for

nearly 50% of the variance in VT across individuals. These results will help individuals to determine VT without expensive laboratory testing.

¹ Gender (male = 1, female = 2)

EFFECT OF ATTACHMENT ANGLE ON STEP COUNT ACCURACY OF ELECTRONIC PEDOMETERS

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PURPOSE: The step counting accuracy of pedometers is dependent upon neutral positioning on the body, where neutral is defined as 0° of incline in the frontal and sagittal planes when worn at the waistline. For example, a recent study by Crouter et al. (MSSE 37(10):2005) found that pedometer accuracy was influenced by BMI, waist circumference, and attachment angle. Due to the use of human test subjects, however, these results could not differentiate the influence of the anthropometric variables from attachment angle on accuracy. Therefore, the purpose of the present study evaluates the influence of attachment angle on step counting accuracy of pedometers in a controlled testing environment using a shaker table. **METHODS:** Five spring-levered (SW651) and five piezo-electric (NL1000) pedometers were tested at 24 attachment angles using adjustable mounting brackets on a shaker table. For each angle tested, the shaker table oscillated at 140 RPM (simulating a 2.5 MPH walking intensity) for approximately 520 steps. Angles tested included a neutral position, as well as 6 angles (± 5 , ± 10 , ± 15 , ± 20 , ± 25 , ± 30 degrees) of rotation in the frontal and sagittal planes relative to the neutral position. Step counts for each pedometer and each attachment angle were compared with a control pedometer of the same model mounted on the shaker table in the neutral position. The percent difference (%SC, steps) between test and control pedometers was calculated such that 0% denoted no difference. A one-way RM ANOVA was used to evaluate mean differences in %SC across the 24 attachment angles. **RESULTS:** Mean values for %SC for the SW651 were significant ($P<0.05$) at attachment angles of +25°



(Mean±SE: 80.5±19.5%) and ±30° (99.9±0.04% and 99.9±0.05%) in the frontal plane, and ±30° (99.9±0.04 and 99.8±0.18%) in the sagittal plane. %SC was not significant for the NL1000 pedometers at any attachment angle (P=0.67). CONCLUSION: Based on the results of this study, extreme attachment angles may affect step counting accuracy of lever-arm pedometers when worn by human subjects at the waistline. In contrast, step counting accuracy of the piezo-electric pedometer did not decrease at the angles tested. When used in overweight or obese populations, a piezo-electric pedometer may be more appropriate for monitoring walking activities.

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PREVALENCE OF ELEVATED FASTED BLOOD GLUCOSE VALUES IN MONTANA COLLEGE STUDENTS

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Diabetes is a leading cause of death and disability in the United States. Ninety to ninety-five percent of the cases are type II diabetes. Inactivity, diet, older age, obesity, minority, ethnicity, family history, and lower socioeconomic status are all risk factors for the development of type II diabetes. PURPOSE: To determine the prevalence of abnormal glucose kinetics and diabetes in a population of 150 upper level undergraduate university students in health and human performance disciplines using fasted blood glucose and a glucose tolerance test (when appropriate). METHODS: Blood glucose values were obtained after a twelve hour fast using a One Touch® glucose monitor. Additionally, oral glucose tolerance tests were performed on most subjects. Height, weight, and gender were collected from all subjects and BMI was calculated. RESULTS: Average fasted blood glucose was 99.5mg/dL with over 24% of students demonstrating abnormal glucose kinetics (fasted blood glucose > 100 mg/dL) including 20 students (13.3%) with fasted blood glucose levels suggesting diabetes (>126mg/dL). CONCLUSION:

More subjects than predicted (estimated national norm = 14.4% persons aged >20 years) were above the normal range for fasted blood glucose. The prevalence of students at risk for, or living with, diabetes is higher than expected in typically healthy populations. Hopefully the implications of our data will encourage campus health screenings and risk modification programs.

COMPARISON OF THREE CONSUMER GRADE BIOELECTRICAL IMPEDANCE ANALYSES DEVICES AND SKINFOLD MEASUREMENTS.

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Many techniques to assess body composition require expensive equipment or trained technicians. Bioelectrical impedance analysis (BIA) is an indirect, simple method to assess body composition and there are several inexpensive consumer models on the market. PURPOSE: The aim of this study was to evaluate the accuracy of three consumer BIA models, compared with percent body fat as assessed by 7 site skin fold thickness (7SKF). In addition this study examined the relationship between BIA and body fat distribution. METHODS: One-hundred and four male (n=52) and female (n=52) volunteers ranging from 18-62 years (29.13±1.42) enrolled in this study. Anthropometric measures included height, weight, waist to hip ratio, skinfolds [9 different sites both left and right side] and percentage body fat, as assessed by 7SKF and consumer BIA devices; hand to hand (HH), leg to leg (LL), and fingers to fingers (FF). Physical activity data was assessed using a self report physical activity questionnaire. All participants were required to adhere to standard BIA and skinfold testing guidelines. This study was approved by the Institutional Review Board at Linfield College. RESULTS: There were no significant differences between percent body fat as assessed by HH (20.58 ± 0.89) and 7SKF (20.28±0.71). Percent fat as assessed by FF (23.37±0.76) and LL (23.13± 0.83) were significantly higher than 7SKF (p<0.01). All three consumer BIA devices correlated (r ranged from 0.812 to 0.853, p<0.01) with SKF, with the HH method

having the highest correlation. All three consumer BIA devices were more strongly correlated with 7SKF in those reporting less cardiovascular physical activity (r ranged from 0.889 to 0.927, $p < 0.01$). The LL had a strongest correlation to the sum of upper skinfold measures and the HH had the strongest correlation to lower skin fold measures ($r = 0.817$, 0.858 , respectively, $p < 0.01$). **CONCLUSION:** This data suggest that the HH is the most accurate of the consumer models studied. These results suggest further research to determine the influence of the amount of physical activity on the accuracy of consumer grade BIA analysis devices.

EFFECTS OF EXTERNAL ANKLE SUPPORT ON PLANTAR FLEXED INVERSION.

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PURPOSE: To prevent ankle injury, many athletes wear external ankle support. The majority of studies examining ankle support, however, have not tested braces at the position in which ankle injury most often occurs; plantar flexed inversion (Verhagen, et al. 2001; Wiley & Nigg, 1996). The purpose of this study was to test two non-rigid stabilizers, a well known lace-up brace (LU) and a new Velcro brace (VB), at two plantar flexion (PF) angles and to determine the effects of the two braces on ankle inversion, both in pre and post exercise conditions. **METHODS:** Fourteen subjects were tested while standing at 20° and 30° of PF on an inversion platform, which inverted to 35°. All subjects performed all conditions, including a bare ankle condition (platform angles x brace x pre/post exercise). Ten trials were performed for each condition. A Biometrics twin axis electrogoniometer (1000 Hz) were used to record maximum inversion (ROM), maximum inversion velocity (Vmax) and time to maximum inversion (Trom) via Datapac Software (Run Technologies). Data were filtered at 18 Hz and analyzed via a 2x3x2 repeated measures ANOVA. IRB approval was obtained and participants signed consent forms. **RESULTS:** Statistically significant differences were noted between brace and

angle conditions for ROM and Vmax. ROM was on average 12% lower for the two brace conditions, and Vmax was lower by 18%, at 30° PF in comparison to 20° PF. Both brace conditions had significantly lower Vmax than the bare ankle condition (24%), but not from each other. However, ROM was not significantly different between the braces and bare ankle, although the VB brace did decrease ROM by 12% and 9%, respectively, to the bare ankle and LU brace at the 20° angle. No significant differences were noted for pre to post exercise, nor for Trom. **CONCLUSION:** The two braces appear equally effective in keeping the rate of inversion lower, for both PF angles. The differences noted between PF conditions were interesting, considering the ankle is considered to be less stable with greater PF, but the ROM and Vmax were less in the greater PF condition, regardless of brace or no brace. The VB brace may be slightly better at reducing ROM at 20° PF angle, but the actual change in ROM was small. Personal preference of brace style showed an even split among participants.

A COMPARISON OF PLANNED AND LEISURE TIME ACTIVITY AS ASSESSED BY A SIMPLE PHYSICAL ACTIVITY QUESTIONNAIRE.

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Physical activity questionnaires (PAQ) have been used to assess basic activity and fitness level in a non-invasive and quick way. Regular participation in daily physical activity is recommended for health benefits. Many studies use PAQs as a method of predicting physical activity trends and health outcomes. **PURPOSE:** The aim of this study was to examine the amount of self reported physical activity with relation to age, body composition, planned physical activity, and leisure time activities. **METHODS:** Fifty-two male and 52 female volunteers ranging from 18-62 years (29.16 ± 1.41) enrolled in this study. A self-administered physical activity questionnaire was given to all participants. The questionnaire was used to estimate participation in cardiovascular



exercise, strength training, flexibility, stretching, and leisure time activity. Physical activity intensity levels were classified as mild, moderate or vigorous and each activity was assigned metabolic equivalents (MET). Energy expenditure (kcal/week) was then determined. Activity dimension (ACT) was calculated based on self-report leisure time activities. Anthropometric data was collected for the following variables: height, weight, and percentage body fat as assessed by 7-site skin fold (SKF). This study was approved by the Institutional Review Board at Linfield College. **RESULTS:** Greater involvement in cardiovascular activity was associated with lower percent body fats ($r=-0.403$, $p<0.05$). Age was negatively correlated with exercise intensity ($r=-0.447$, $p<0.05$) and positively correlated with percentage body fat ($r=0.405$, $p<0.05$). Individuals with higher ACT scores reported higher energy expenditures in planned physical activity than those with lower ACT scores (3634.78 ± 581.92 vs. 2193.00 ± 341.38 kcals/week, $p<0.05$). Of the participants, 29.8% ($n=31$) did not meet the Surgeon Generals recommendations for cardiovascular exercise. Of these, 41.9% perceived themselves as more active than their peers and 35.5% thought they were as active. **CONCLUSION:** These data suggest that increased involvement in planned physical activity may influence increased caloric expenditure during leisure time activity. More research is suggested to examine individual perceptions of involvement in physical activity in a sedentary population.

IMPACT AND PUSH-OFF FORCE SYMMETRY IN DOMINANT VERSUS NON-DOMINANT LEGS DURING A JUMP LANDING/CUTTING TASK.

L. Rosado, M. Bennett, S. Kuhlman, D. Clark C. Harris, FACSM, and M. DeBeliso
Boise State University, Boise, ID

PURPOSE: To assess the symmetry between dominant and non-dominant legs for the impact and push-off kinetics of an unanticipated jump landing and cutting task (JLC) **METHODS:** Female subjects ($n = 9$, Age: 22.33 ± 3.74 years., Mass: 60.23 ± 6.89 kilograms), all right leg dominant, were required

to do a two-footed landing and then cut either to the right, center, or left using her preferred cutting style. The JLC required subjects to jump horizontally a distance of $\frac{1}{2}$ of her maximal standing broad jump and reach a height vertically at the middle of the horizontal jump that was $\frac{1}{2}$ of her maximum vertical jump height. Immediately upon landing subjects sprinted at a 30 degree angle to the right (RC) or left (LC) or sprinted straight ahead (CC). Four trials to each direction were performed in a random order and the direction was identified by a light that was activated coincident with landing. Landings and push-offs from the JLC were on flush mounted Kistler force plates and ground reaction forces were collected at 1250 Hz. Resultant ground reaction force peaks for impact for the dominant leg (IPD in Bodyweights, BW) and the non-dominant leg (IPN in BW) and for push-off for the dominant leg (POD, BW) and non-dominant leg (PON, BW) were calculated from three dimensional force recordings. Comparisons between legs for the 3 cutting conditions were made using ANOVA with repeated measures and post-hoc comparisons with t-tests. **RESULTS:** For the RC and CC conditions, there were no differences between IPD and IPN (RC: 2.16 ± 0.97 vs. 1.91 ± 1.08 ; CC: 2.20 ± 0.93 vs. 1.82 ± 0.97). For the LC condition, IPD was significantly greater than IPN ($p=0.005$) (2.27 ± 1.06 vs. 1.47 ± 0.62). For push-off force in the RC and CC conditions, there were no significant differences between POD and PON (RC: 1.61 ± 0.48 vs. 2.20 ± 0.49 ; CC: 2.06 ± 0.32 vs. 1.60 ± 0.41). POD was significantly greater than PON for the LC condition ($p<0.001$) (2.62 ± 0.32 vs. 1.15 ± 0.23). **CONCLUSION:** Of the three conditions assessed for the JLC, the more extensive the cut to the non-dominant side, the greater the impact and push-off force on the dominant leg compared to the non-dominant leg.

KINEMATIC DIFFERENCES BETWEEN SHOD AND BAREFOOT RUNNERS AT A RECREATIONAL PACE

S.P. Sears, L. B. Greer, J. L. Dorn, J. M. Neil, M. L. Wamre, A.J. Zink.
Gonzaga University, Spokane WA.

Research regarding running kinetics has reported that running barefoot alters gait patterns and loading forces during moderate to high running paces. **PURPOSE:** To determine if previously reported differences in running kinematics observed between shod and unshod runners exists at a slower running pace. **METHODS:** Fifteen female runners (20.5±0.5 years) that were currently training (>10 miles per week) volunteered for this study. After a warm up, each subject performed two 3-minute trials both shod and unshod while running on a treadmill at a speed of 2.68 m/s (6 m/h). All motions were recorded orthogonal to the plane of motion with an analog video camera at 60 Hz. A three segment kinematic model of the leg was created from the videographic data. Intersegmental angles for the hip, knee and ankle and the angle of inclination of the foot relative to the ground were calculated during heel contact and heel off. Stride length, stride frequency, swing time, and horizontal displacement of the ankle throughout the stance phase were also measured. A two-tailed t-test: paired sample for means with a Bonferroni adjustment was used to determine if any of the kinematic variables were statistically different. **RESULTS:** Stride length (unshod: $\mu=1.79\text{ m}\pm 0.11$; shod: $\mu=1.87\text{ m}\pm 0.12$) and stride frequency (unshod: $\mu=1.50\text{ strides/sec}\pm 0.08$; shod: $\mu=1.44\text{ strides/sec}\pm 0.09$) were found to be statistically different ($P<0.01$) between the two conditions. The knee angle at heel contact (unshod: $\mu=155.86^\circ\pm 6.7^\circ$; shod: $\mu=161.01^\circ\pm 7.8^\circ$) and the angle of inclination of the foot (unshod: $\mu=4.5^\circ\pm 7.8^\circ$; shod: $\mu=17.4^\circ\pm 6.6^\circ$) were also determined to be statistically different ($P<0.05$). There was also a significantly ($P<0.01$) smaller amount of horizontal displacement of the ankle marker in relation to the hip marker at heel strike between conditions (unshod: $\mu=0.12\text{ m}\pm 0.04\text{ m}$; shod: $\mu=0.16\pm 0.03\text{ m}$). **CONCLUSION:** Similar to previous research examining kinematics of runners at moderate to higher paces, unshod runners were observed to take shorter and more frequent strides as compared to shod runners when compared using a similar, slower pace. In addition, differences in stride length were also primarily attributable to a smaller horizontal displacement of the foot in relation to the

body at heel strike when not wearing shoes. The difference in the horizontal displacement of the ankle in relation to the hip was due to a smaller degree of knee extension exhibited by unshod runners in comparison to shod runners.

FATNESS, FAT PATTERNING, AND BLOOD PRESSURE: RELATIONSHIPS, PREDICTION, AND TRACKING IN CHILDREN

¹J.A. Vincent, ¹C.A. Geithner, M.F. ²Cooper, ³S.R. Siegel, ⁴C.A. Weixel, and ⁴E.M. Windlin.

¹Gonzaga University, Spokane, WA; ²Creighton University, Omaha, NE; ³California State University-San Bernardino, San Bernardino, CA; ⁴Benewah Medical and Wellness Center, Plummer, ID.

Body composition and metabolic syndrome indicators are moderately stable from childhood and adolescence into young adulthood (Campbell et al., 2001; Katzmarzyk et al., 2001), and are associated with increased risk for metabolic and cardiovascular disease and, subsequently, premature mortality. Early detection of obesity and hypertension is important in order to effectively treat, monitor and prevent future health complications (Roccella, 2004), particularly in American Indian (AI) children, who have a higher prevalence of obesity, diabetes, and chronic disease risk (Story et al., 1998, 1999). **PURPOSE:** To assess prevalence of obesity and hypertension in AI and Caucasian (C) children, and to assess tracking of obesity and hypertension and the usefulness of obesity indices for prediction of later disease risk. **METHODS:** Body mass, stature, resting systolic and diastolic blood pressure (SBP, DBP), waist circumference (WC), and five skinfolds (SKF) were measured on 477 children, ages 5-10 (mean age=7.8±1.5 years) (247 males, 230 females; 59.3% AI, 40.7% C). Body mass index (BMI), sum of five SKF (SUMSKF), waist/hip ratio (WHR), and subscapular/triceps ratio (SUB/TRI) were calculated. BMI, WC, SBP and DBP percentiles were identified for each individual using national reference data ($\geq 95^{\text{th}}$ = overweight, obese, or hypertensive, respectively). Sixty-one children (34 males, 27 females) were measured again three years



later. Statistical analyses were run using SPSS 11.0 for MacIntosh. RESULTS: Based on BMI percentile, 28.5% of the sample was classified as overweight, and 9.0% as hypertensive by SBP or DBP percentile. BMI, SUMSKF, and WC were significantly related to SBP and DBP ($r=0.20$ to 0.38 , $p<0.05$), after controlling for age, whereas WHR and SUB/TRI were not. Sex and race differences were found in correlation coefficients and predictors of blood pressure. WC was the best and most consistent predictor of SBP and DBP for the sample and by subgroups, accounting for 24.1% of the variance in SBP and 9.6% of the variance in DBP. Inter-age correlations indicated strong stability for both BMI and WC (Spearman's $\rho=.804$ and $.662$, respectively; $p<0.01$) across a three-year-period; however, SBP and DBP did not track well between measurements. CONCLUSION: Overweight (BMI) and abdominal obesity (WC) track well over a three-year period in children. WC is a strong predictor of current blood pressure as well as later risk for hypertension and other chronic disease. Therefore, BMI and WC should be included in regular screenings of children for early identification of current and future health risk.

Funded by the Public Health Nursing Health Promotion/Disease Prevention Project.

DOES SUPPLEMENATATION OF IRON IN FEMALE ATHLETES ENHANCE VO_{2MAX} AND BLOOD IRON?

H. Schacher, M. Collins, and C. Robinson
Lewis-Clark State College, Lewiston, ID

The purpose of this study was to determine whether female athletes experienced changes in aerobic capacity, hemoglobin, hematocrit, ferritin, and VO_{2max} levels after taking iron and Vitamin C supplements over a two month trial. METHODS: The participants were seven females competing on a collegiate cross-country team. Participants completed pre-season physical, health history questionnaire, and completed a summer training program. After pre -blood draws were collected at mid season, participants received 16mg of iron and 500 mg of vitamin C each morning for two months. Blood was drawn twice during this

study: mid-season and postseason. Samples were analyzed to determine any changes in hematocrit, hemoglobin, and ferritin levels. The participants completed a 1.5 mile run during preseason, midseason, and post season to determine VO_{2max} changes throughout the season. One participant was removed from the study due to injury. Paired t-Tests were performed to determine any significant changes in ferritin, hematocrit, and hemoglobin levels between pre and post test samples. RESULTS: The results from the ferritin t-test were pre 26.33 and post 35.83 with a $p=.015$. The hematocrit t-test was pre 38.53 and post 40.40 with a $p=.017$. The pre hemoglobin t-test was 13.08 and post mean was 13.80 with the $p=.002$. A Single Factor ANOVA was performed to determine any changes in VO_{2max} between preseason, midseason and post season. The pre-season VO_{2max} mean was 54.80, midseason mean VO_{2max} was 55.50, and postseason VO_{2max} mean was 58.34 and with a $p=.019$. The results of the t-tests performed on hematocrit, hemoglobin, and ferritin levels indicate that supplementation of Vitamin C and iron enhanced iron blood levels in these participants. Participants' diets were not monitored or altered throughout the duration of the study and small increases in ferritin levels may be from dietary intake. Significant increases in ferritin levels indicate that iron supplementation enhanced blood iron levels. Increases in VO_{2max} may have been due to training, but the corresponding increases in ferritin iron levels indicate that supplementation of iron contributed to enhanced VO_{2max} . At mid season, training is not designed to increase VO_{2max} but to increase lactate threshold. Had fitness been an issue larger increase in VO_{2max} between beginning and midseason assessments would have been expected. However there was a significant increase between midseason and post season VO_{2max} (+2.85ml/kg/min or an increase of 4.9%). Results indicated that increase in ferritin levels may have played a role in increasing VO_{2max} in these participants.

LCSC Faculty and student Development Grant

Additional abstracts— not for student awards

EFFECTS OF MODIFIABLE LIFESTYLE FACTORS ON CALCANEUS ULTRASOUND MEASUREMENT OF BONE HEALTH IN ADOLESCENT GIRLS

¹M. L. Robinson, ²K. Winters-Stone, ³K. A. Gabel and ³D. Dolny

¹Lewis-Clark State College, ²Oregon Health & Science University, ³University of Idaho, Moscow Idaho.

Research concerning the influence of modifiable lifestyle factors on adolescent bone health is limited, especially using calcaneus ultrasound (CUS) to measure bone health. The purpose of this study was to determine the influence of modifiable lifestyle factors on adolescent girls' bone health measured by CUS. Participants were 114 girls, ages 14-18 (15.97±.7), currently enrolled in high school physical education/health classes. Participants were measured for height and body weight. One CUS scan was performed on each participant. The CUS machine calculated a stiffness index (SI) score. The SI reflects bone microarchitecture and is calculated from the mean of speed of sound and broadband ultrasound attenuation measurements. Lifetime number of menstrual cycles, current calcium intake from 2-3 day food records, and hours spent in physical activity over the last 10 years were obtained through questionnaires. Cumulative physical activity hours were separated into four classifications: cardiovascular, impact, resistance, and recreational activities (such as golf and softball). Pearson correlations between SI (dependent variable) and age, height, body weight, number of menstrual cycles, current calcium intake, and hours spent in cardiovascular, impact, resistance, and recreational activities (independent variables) were performed and indicated significant positive relationships between SI and body weight ($r=.26$, $p<.01$), current calcium intake ($r=.28$, $p<.01$), and total hours spent in impact activities ($r=.45$, $p<.01$). A multiple regression analysis was performed to determine predictors of SI with the independent variables. Multiple regression analyses indicated that collectively, hours spent in

impact activities, current calcium intake, and body weight ($r^2=.37$, $p=<.01$) significantly predicted SI. Our data indicate that impact activity, current calcium intake, and body weight positively influence bone properties of the calcaneus in adolescent girls. Encouragingly, our results suggest that adolescent girls can make lifestyle choices early in life that optimize their bone health that may ultimately reduce their risk of osteoporosis in later life; however, this assumption must ultimately be confirmed through randomized, controlled trials.

This study was supported by a Lewis-Clark State College faculty development grant.

HEALTH AND FITNESS VARIABLES AS THEY RELATE TO BODY COMPOSITION IN ADOLESCENT BOYS

¹C. Robinson, and ²D. Dolny

¹Lewis-Clark State College, ²University of Idaho, Moscow, ID

The purpose of this study was to assess if VO_{2max} is a predictor of body composition and to identify other lifestyle variables that may effect body composition in 85 adolescent males, ages 12-15 (13.92±.996). Measurements of participants included: height, weight, percent body fat (%BF) from skin folds and Body Mass Index (BMI), and predicted VO_{2max} derived from the One-mile run and the One mile walk test correlated with bike ergometer test. Physical and leisure activities patterns, ethnicity, and food intake patterns were obtained through questionnaires. Pearson correlations between %BF and the following variables were calculated: height, weight, activity hours, Food Intake Score, hours of sleep, TV hours, computer hours, TV+computer hours, BMI, VO_{2max} from the One-mile run and the One mile walk test. Significant relationships existed between %BF and food intake score ($r=-.217$, $p=.046$), sleep hours ($r=-.253$, $p=.019$), TV hours ($r=.279$, $p=.010$), computer hours ($r=.218$, $p=.045$), TV+computer hours ($r=.326$, $p=.002$), weight ($r=.634$, $p=.000$), BMI ($r=.734$, $p=.000$), VO_{2max} one-mile walk ($r=-.548$, $p=.000$), and VO_{2max} one-mile run ($r=-.775$, $p=.000$). A multiple regression analysis was run with %BF as the dependent variable and the following



impact activities, current calcium intake, and body weight ($r^2=.37$, $p<.01$) significantly predicted SI. Our data indicate that impact activity, current calcium intake, and body weight positively influence bone properties of the calcaneus in adolescent girls. Encouragingly, our results suggest that adolescent girls can make lifestyle choices early in life that optimize their bone health that may ultimately reduce their risk of osteoporosis in later life; however, this assumption must ultimately be confirmed through randomized, controlled trials.

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%BF as the dependent variable and the following set of independent variables: VO_{2max} One-mile run, TV+computer time, physical activity, age, food intake score, and VO_{2max} One-mile walk. The final prediction model include one independent variable, which was VO_{2max} from the One-mile run [$F(1,82)=125.179$, $p=.000$, $r=.755$, $r^2=.601$]. This is one of the first studies to identify VO_{2max} as a significant predictor of adolescent %BF. All obese and a large percentage of the overweight participants had a VO_{2max} value from the One-mile run which classified the participants below the healthy recommendation based on age. From this study it appears the most significant prediction for a healthy %BF in adolescent subjects is measurement of their VO_{2max} .

This study was supported by Lewis-Clark State College, Department of Education.

The NWACSM Chapter appreciates the time, effort, and expertise past officers expended on the chapter during their service. We recognize in gratitude:

*Trish Root
Dan Heil
Stephen Aquino*

Thank you!



Continued from page 5—CEP needed

Preferred qualifications include demonstrated collaborative, team-oriented approach, RCEP certification, research productivity with a focused line of research relevant to position, and a record of research publications and successful grant-writing experience. Responsibilities include teaching graduate/undergraduate clinical exercise physiology or other related courses, advising, and directing graduate student theses, projects, practicums, internships, and comprehensive exams, advising undergraduate students, participating as a collaborative team player with faculty in the Clinical and Experimental Exercise Science graduate degree and the Exercise Physiology and Metabolism undergraduate degree, sustaining a focused and externally funded clinical or basic science research program in an area related to clinical exercise physiology, publishing scientific papers, contributing to developed and supervision of a university-based exercise and nutrition clinic for normal and special populations (cardiac, pulmonary, metabolic, cancer, immunologic, neuromuscular, musculoskeletal, orthopedic), establishing clinical collaborations in health-related disciplines at the university, community and state levels.

Salary will be commensurate with qualifications and experience. Screening begins April 1, 2006.

To apply send cover letter with curriculum vitae to E. Carolyn Johnson, PhD, FACSM, Search Committee Chair, Washington State University Spokane, Program in Health Sciences, PO Box 1495, Spokane, WA 99210-1495. For information contact Patti Petersen, Petersen@wsu.edu. The complete description is available at www.chr.wsu.edu. WSU is an EEO/AA Educator and Employer

—Sally E. Blank, Ph.D., FACSM, Washington State University Spokane
E-mail: seblank@wsu.edu

ACSM News

ACSM Becomes Member of FASEB (Federation of American Societies for Experimental Biology)

President Carl Foster, Ph.D., FACSM, President-elect J. Larry Durstine, Ph.D., FACSM, and Executive Vice President James R. Whitehead are exceptionally pleased to announce that ACSM has been approved as a member of FASEB, per the unanimous vote of the FASEB Board. Considerable relationship-building and advance work has occurred over the last two years, which led to this superb success. ACSM membership in FASEB fulfills a historic goal for ACSM—a two-decades-old aspiration held by so many of our past presidents and others, including Carl Gisolfi, Ph.D., FACSM. ACSM intends to ramp up very quickly to take full advantage of this opportunity and to expand ACSM's role and position in the science community. FASEB is composed of 22 societies with more than 80,000 members, making it the largest coalition of biomedical research associations in the United States. FASEB's mission is to enhance the ability of biomedical and life scientists to improve—through their research—the health, well-being and productivity of all people.

Six Books Now Available in the ACSM Action Plan for Health Series

Developed by the American College of Sports Medicine, the ACSM Action Plan for Health Series offers authoritative advice on using exercise and nutrition to optimize health. Along with methods for monitoring each condition, the pros and cons of medication, and diet guidelines, each volume includes programs for strength, flexibility, and aerobic exercise. The ACSM Action Plan for Health Series will help readers do more than survive; they will thrive and feel better than they ever thought possible! These resources are great for patient education, as course supplements, or to have in your professional library. The two newest books in the series include Action Plan for High Cholesterol and Action Plan for High Blood Pressure. These books join: Action Plan for Arthritis, Action Plan for Diabetes, Action Plan for Osteoporosis, and Action Plan for Menopause. To learn more, click on the individual book titles or visit www.humankinetics.com.



Student Page

People dynamics

By Amy Hammons, Linfield College

(Amy is a senior at Linfield College. This article was written following an internship during which she devised an exercise program for Linfield College faculty members and their families.)

People are dynamic. That is the best statement I can make to describe my senior internship project.

Linfield students are required to complete a capstone project. I developed and implemented a lifestyle behavior change project specifically for overweight and obese individuals. In these case studies, I used a behavior change contract. The participants set goals to developed a lifestyle change. Most goals focused on nutrition and physical activity as well as some mental and emotional aspects of their lives. During the summer of 2005, I did most of my research and program development with the help of Dr. Janet Peterson and Dr. Michael Jaszko. The two were integral in the design and both selected participants for the study.

I ultimately wanted to raise the issue of obesity in the community, and my mechanism for doing that was empowering individuals with the knowledge and skills for their own lives so they can influence others. Education and skill development were the center of this project.

After determining baselines using a five-day self report for both physical activity and nutrition, the participants either began a 10,000K-a-Day program or a circuit weight training regimen. Selection depended on the ability of the participant and their goals. We used a three-site skin fold test to determine their body composition, as well as measured height, weight, waist-to-hip ratio, blood pressure, and resting heart rate. Measurements were taken at three different intervals over the six months of the program.

All patients showed positive health improvements either in nutrition or in anthropometric

measurements. But this internship grew to more than a school assignment for me. I came to realize I was working with individuals who are people, not test subjects. They came to me with problems wanting answers. For many, their problems went beyond their weight and involved other life issues. Being only a college student facing participants in the study that were my parents' age proved challenging. I learned to work through barriers to get to the root of the problems and be solution oriented.

One of my test subjects, Carol*, came to me for help in September. Carol's goal was to make exercise and nutrition a priority in her daily life. After having twins and letting her busy life catch up with her, she was ready to be proactive. At the midpoint of the program, Carol had dropped nearly 4% body fat and more importantly was feeling great. She was very encouraged about the progress. Due to her positive results, Carol has vowed to keep up with the changes in her lifestyle.

Another participant, Leslie*, is morbidly obese and has struggled with various health issues her whole life. Leslie is the oldest living member of her family at the age of 42 and initiated the program at 42.8% body fat. Having just moved to the area, she was fascinated by the colored leaves in the Willamette Valley and initially took great pride in walking outdoors. Leslie's behavior change goals were to exercise more regularly and to learn more about healthy nutritional choices. Leslie's started on the 10,000K-a-Day program, but, due to injuries, she has changed her focus to improving her nutritional choices and we have worked together to change her eating habits.

I have found that throughout this program everyone involved has grown immensely, including me. Behavior change isn't easy. Yet, this experience has leads me believe that people can change for the better. Often times, lack of information about what

Continued on page 34 – People dynamics



Results from the Student Peers Evaluation Annual Meeting 2006

Thank you to all the students who participated in evaluating the poster and oral student presentations. Unfortunately, only four evaluations were turned in for the student posters, so a clear winner in each category could not be assessed. We did have sixteen evaluations for the student oral presenters and the results are below. Please remember that out of 174 registered students only sixteen evaluations were turned in and all student presenters were quite outstanding. Congratulations to all winners and happy spending!

Student Category	Best Oral Presentation	Best at Fielding Questions	Most Interesting (Just Cool Science)
Undergraduate	CM Murphy	CM Murphy	CM Murphy
Masters	M Spiroski	M Spiroski	Spiroski for Wagner
Doctoral	BN Torgrimson	WM Silvers	BN Torgrimson

Jessica Meendering, the new Regional Student Representative



Hello, fellow members of NWACSM. I want to thank all of you for giving me the opportunity to represent you and the Northwest region as the new regional student representative.

Having run against so many outstanding applicants, it is truly an honor to be able to serve you. I am excited to help our awesome national student representative, Jenni McCord, continue to build the student participation in our chapter by spreading the word about our organization to undergraduate students and graduate students in the area. I have learned so much from being a student member of NWACSM and I hope to introduce many new students to the opportunities that NWACSM has to offer. If you have any ideas to increase student participation in our area or have questions as to how you can become involved with NWACSM, please do not hesitate to contact me: <jgee@uoregon.edu>

Resources for Soon-to-Be Graduate Students, Faculty Members, and the In-Between

- **Tomorrow's Graduate Students and Post-Docs**
<http://ctl.stanford.edu/Tomprof/postings.html>

This website holds a huge resource of information for students, post-docs, new and senior faculty members. Topics include everything from intriguing education questions, study tips, obtaining your first academic career, what to look for in a research adviser, and much, much more!

- **Making the Right Moves: A Practical Guide to Scientific Management for Postdocs and New Faculty:**

<http://www.hhmi.org/grants/office/graduate/labmanagement.html>

You can download this Howard Hughes Medical Institute book (for free) from this website or order a copy of the book. This book contains a huge bank of information and it is strongly recommended if you are interested in running your own research lab.

- **Other Helpful Resources:**

Jerrard, R., & Jerrard, M. (1998). *The grad school handbook: An insider's guide to getting in and succeeding*. New York: Perigee

Rice, R.E., Sorcinelli, M.D., Austin, A.E. 2000. *Heeding New Voices: Academic Careers for a New Generation*. Washington, D.C.: American Association for Higher Education.



Continued from page 32, People dynamics

it takes to be healthy is a road block to success. I have found, that with the right information and the adoption of healthy goals, all people can be successful.

The experience has been very fulfilling and challenging. I have developed friendships with many of them because of the personal nature of the issues that we had to address. But I did not only learn a lot about

working with people, I learned quite a bit about myself. The first leg of this project required that I perform a lifestyle behavior change myself. Before the program, I was unhealthy. Who wants to listen to an unhealthy person giving health advice? So, I made the commitment and researched on how to develop ways toward a better lifestyle. I'd like to think that my effort will have a lasting positive impact on the participants' lives; because it will on mine.

**Names were changed.*

Highlighted Undergraduate Research

Jennifer Vincent was the winner of the Undergraduate Research Poster Presentation at NWACSM's Annual Meeting! Check out the undergraduate research at Gonzaga University.

Fatness, Fat Patterning and Blood Pressure: Relationships, Prediction, and Tracking in Children

Jennifer A. Vincent¹, Christina A. Geithner¹, Molly F. Cooper², Shannon R. Siegel³, Cheryl A. Weixel⁴, and Eva M. Windlin⁴. — ¹Gonzaga University, Spokane, WA; ²Creighton University, Omaha, NE; ³California State University-San Bernardino, San Bernardino, CA; ⁴Benewah Medical and Wellness Center, Plummer, ID.

The purposes of this study were:

- 1) To assess prevalence of obesity and hypertension in American Indian and Caucasian children.
- 2) To determine the relationships between measures of fatness, fat patterning and blood pressure.
- 3) To assess the usefulness of fatness and fat patterning indices for prediction of blood pressure and later disease risk.
- 4) To assess tracking of fatness, fat patterning and blood pressure over time in these children.

Twenty-Eight % of the sample was overweight by BMI percentile, and 9.0% was classified as hypertensive based on percentiles for systolic and/or diastolic blood pressure (SBP and DBP). Measures of fatness (BMI, waist circumference or WC, and sum of skinfolds) were significantly related to SBP and DBP, while measures of fat patterning (waist/hip ratio and subscapular/triceps skinfold ratio) were not. WC was the strongest and most consistent predictor of SBP and DBP for the sample and by subgroups, accounting for 24.1% of the variance in SBP and 9.6% of the variance in DBP. Sex- and race-associated differences were found in correlations among variables and in the predictors of SBP and DBP. Inter-age correlations indicated strong stability for both BMI and WC (Spearman's rho=.804 and .662, respectively; $p < 0.01$) across a three-year-period; however, SBP and DBP did not track well between measurements. Overweight (BMI) and abdominal obesity (WC) track well over a three-year period in children. WC is a strong predictor of current blood pressure as well as later risk for hypertension and other chronic disease. Therefore, BMI and WC should be included in regular screenings of children for early identification of current and future health risk.

(Funded by the Public Health Nursing Health Promotion/Disease Prevention Project)

Do you want your research featured? Contact Student Reps Jessica Meendering: jgee@uoregon.edu or Jenni McCord: jlmccord@uoregon.edu



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