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In this Issue:

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Endurance and Sports Medicine

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The mission of the International Institute for Race Medicine (IIRM) is to promote the health and safety of athletes participating in endurance events through education, research, and the development of medical best practices.

Opinions expressed in *Endurance and Sports Medicine* are not necessarily endorsed by the IIRM.

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IIRM NEWS

Announcing the IIRM Research & Education Fund

Donations collected through this new fundraising campaign will be used for research to better understand the incidence of life-threatening conditions occurring at races, to promote dissemination of education to medical and health care providers volunteering at mass-participation athletic events, and to help develop an educational component of the IIRM website targeting the lay runner.

Similar to the AMAA Premier Membership program, donors contributing to the Research & Education Fund at the Olympian, Patron, and Supporter levels will receive a one-year membership (new or renewed) and be recognized on the IIRM website and in *Endurance and Sports Medicine* (unless you choose to remain anonymous).

To make a contribution, go to www.racemedicine.org and click on the "Donations" icon on the home page. If you prefer to mail your contribution, please make your check payable to the International Institute for Race Medicine (or IIRM) and send to 41 Lafayette Lane, Norfolk, MA 02056. Be sure to include your name and contact information with the check so

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LETTER FROM LEADERSHIP

Dear IIRM Members,

As part of the Advisory Board for the International Institute for Race Medicine, I was invited to write to you, our new IIRM members and former AMAA members, about my experience with the organization as both a runner and sports medicine physician. I am a primary care physician with fellowship training in sports medicine and have special interests in musculoskeletal injuries, non-surgical orthopedic problems, and concussion. Among my patients at MedStar Memorial Union Hospital in Ellicott City, Maryland, are runners, triathletes, and bicyclists. I am also the team physician for the University of Maryland at Baltimore County and Stevenson University in Pikesville and have worked as a medical director of several marathons and ultra-marathons, including the Baltimore Running Festival and the JFK 50 Mile.

My introduction to the IIRM and American Medical Athletic Association (AMAA) occurred in 2016 when I, along with MedStar Sports Medicine Vice-President Sean Huffman, PT, represented MedStar in a three-year partnership formed with AMAA's sports medicine symposium held in conjunction with the Marine Corps Marathon. I was then invited by IIRM Executive Director and Boston Marathon Medical Coordinator Chris Troyanos, ATC, to attend the AMAA Boston Symposium and volunteer in the Boston Marathon finish-line medical tent as a "VIP physician." Here begins my 2017 experience of being in Boston for those special events.

The sun shone off the Charles River as I steadily jogged my way along its banks. Nine months ago, while cross-training on my mountain bike, I had slipped and fallen down a steep, mud-slicked ravine, rupturing my quadriceps and derailing my running practice all at once. Now, after enduring surgery and months of physical therapy, I was just getting the "okay" from my surgeon to start jogging again. Although I was grateful to be moving again, being at the Boston Marathon while barely able to run was bittersweet. Still, it had been impossible to pass up the invitation to attend the event as a VIP physician, not only for the invaluable medical experience I would receive as a sports medicine physician but also for the 2017 AMAA sports medicine symposium. It had been equally impossible to pass up the chance to participate in the pre-marathon 5K warm-up run.



Matt (right) and Eric Almli, MD, head of the ER volunteer doctors, in the finish line tent at the 2017 Baltimore Running Festival.

Being at the Boston Marathon while barely able to run was bittersweet.

At the start of the run, at the City Run Store on Boylston, while mingling with the other participants, I encountered some famous—and friendly—faces. I was honored to meet both Bart Yasso, the “mayor of running,” and speedster Molly Huddle, who at the time was the United States women’s 5K record holder. Of course, I was far from competition for either one of them.

As soon as I started to jog, I realized that, despite my decent cardiovascular stamina, my speed was not only lacking, it wasn’t there at all. I fell into a slow pace and found myself surrounded by a handful of runners who had qualified for Boston but who, like me, were suffering from ailments and injuries. They all had undergone unwanted but necessary surgery and knew that they could not run the 26.2 miles; however, they had nonetheless made the trip to Boston from around the United States. These injured runners had made the effort to get there and were determined to make the most of the day and continue to improve themselves.

One runner had come down with pneumonia a few months ago and had wisely stopped training until she made a good recovery. Unfortunately this had taken weeks, and now she was running at my pace, which was fine for a warm-up 5K but certainly not fast enough for a marathon. As we jogged, she realized that she would have to wait for another year to complete Boston’s rigorous course. It was a heartbreaking decision, but necessary, too, for her health and the safety of her future running career.

After completing my run, I returned to find everyone at the running store in the final moments of cleaning up. As it turns out, the organizers never imagined that anyone warming up for the most famous marathon in the U.S. would take an hour to complete the task. Lucky for me, the staff were friendly, if not amused, and allowed me a cup of orange juice before everything was entirely cleared away.

The next day, when the premier event of the weekend occurred, the Boston Marathon, I was treated to the honor of meeting and observing hundreds of volunteers. All day long, from the pre-race meeting in the wee hours of the morning to the bustle of finish line tent A, I watched and learned from the world’s leading experts in sports medicine. Instead of discussing issues in theory before a lectern in a lecture hall, they were actually applying their methods and treating runners with varying degrees of hyponatremia, heat stroke, and dehydration. They treated all of the runners, not just the elite and celebrated, but also the charity runners who, while (much) faster than I could ever hope to be at the time, still needed a full day of running to make it to the finish line. The experience left me fulfilled. I could not run that day, but I did get to work side-by-side with experts who helped me to learn, endure, and achieve my own set of goals at the Boston Marathon.



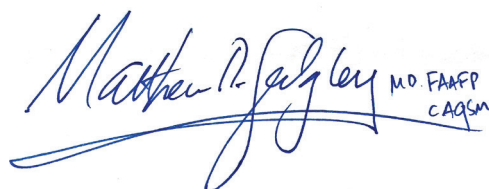
Matt (from left) and friends Sid (who runs to fundraise for fallen US soldiers, sailors, and Marines) and Assistant Race Director “Slim” at the Baltimore finish line.

I watched and learned from the world’s leading experts in sports medicine.

My journey with the IIRM then took me to the organization's conference in October 2017. Having agreed to continue the partnership with MedStar Sports Medicine and hold a meeting in conjunction with the Marine Corps Marathon, the IIRM put on a stellar educational activity at Georgetown University Medical School under the title of the IIRM Sports Medicine Conference Series: Washington, DC. One of the best things was having world-renowned experts lecturing about and discussing running injuries (e.g. chronic exertional compartment syndrome). In the program, we also included a didactic series on treating runners and the Marine Corps Marathon treatment protocols. This allowed participants to learn and discuss pathways for treating hyperthermia from the actual, definitive authors of the original literature on the topic. We will be revisiting this educational format in October 2018 when the conference returns to Washington, DC. I hope you can join us.

When I was invited to write this letter as part of the new publication for the IIRM, I knew right away that I needed to express how important and exciting it is to join this organization. Not only do you become a member of a virtual finish line tent, where you can consult the leading experts in race medicine, but you also get access to a website full of educational videos and can participate in live educational activities. Whether you would like to learn more about treating conditions commonly seen in endurance runners or are interested in how to design and set up a race safety plan, you will find great resources with the IIRM.

Best wishes,



Matthew Sedgley, MD
IIRM Advisory Board

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we can properly recognize you for your donation. All donations are tax-deductible.

To renew your IIRM annual membership without making a donation, go to www.racemedicine.org and click on "Join/Renew."

The following individuals contributed to AMAA or the IIRM Research & Education Fund from April 1, 2017 to March 1, 2018.

Olympian (\$250)

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* Contributions surpass Olympian level
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EXPERIENCE TELLS US

Volunteer Perspective from the 2013 Boston Marathon Finish Line

by Adrienne Wald, EdD, MBA, RN, CNE, MCHES

It is hard to believe that it has been five years since April 15, 2013, a day that changed the lives of so many people. The tragic events of the Boston Marathon bombings are well-documented but some interactions, such as acts of individual and group heroism, have yet to be told.

Adrienne Wald's experience is one of those many stories that still needs to be told.

Regardless of the years that have passed, for many of us, the events of that Monday seem like they happened only yesterday. As we prepare to return to the third Monday in April, the anxiety and impact of the day still rings loudly in every single volunteer who participated on that fateful day.

There are many stories of heroism—spectators, runners, volunteers, race organizers, Boston first-responders, and others jumped to action to save and treat the injured. To me, what is most outstanding and what I love about all of them is their continued spirit. Each one has a willingness to come back to Boston every April to make a difference, and to make a statement. That statement is pretty simple: no terrorist (foreign or domestic) is going to change our way of life and the things we enjoy.

On April 16th, close to 10,000 Boston Athletic Association volunteers, as well as public safety officials from eight cities and towns, will all come together to care for 30,000 runners. In addition to the invaluable service they provide, they are also there to remind everyone that we stand strong. Acts of terror will not change how we live—not here, not now, not ever!

Chris Troyanos, ATC
Medical Coordinator, Boston Marathon
Executive Director, IIRM

The view of the Boston finish line had always been a magical one for me. As a five-time Boston Marathon competitor, the gigantic BAA banner across Boylston Avenue celebrated incredible efforts and hard work, right alongside giant time clocks displaying my range of performances from a triumphant PR (3:53) to some less successful results. However, in 2013, the finish line clock “froze” at 4 hours and 9 minutes and 43 seconds when the first of two bombs exploded. Eerily, at age 57, I had qualified to run the 2013 Boston in 4:07:16* but will never know if I would have crossed the finish before the bombings because I never started the race. Instead, my experience in 2013 was as a nursing professor and head of a team of 30 nursing and exercise science students on the BAA volunteer medical sweep team. With an impressive 28 medical tents and about



Adrienne standing at the 2013 Boston Marathon finish line on April 14, 2013, the day before the race.

* My qualifying time of about 4:07 would have put me within the danger zone, I later learned. It was reported that AMAA runner Dr. Weisberg ran and crossed the finish line at 4:05:59; he experienced hearing loss, mild traumatic brain injury, Cochlear Meniere's, and PTSD. Dr. Weisberg is now actively involved with the Boston Survivor Support Group. There are so many other stories of twists of fate that day and so many, many stories of lessons learned and lives changed.

1,700 medical volunteers (1) we were but a small part of a well-oiled medical care operation providing important services at the oldest, and one of the largest, marathons in the world.

Our team of undergraduates from the University of Massachusetts Boston (UMB) included individuals who each had their own motivations for volunteering that day. I had organized the team after a bad ski accident forced me out of running the 2013 race; I wanted mainly to “pay it back” for the terrific care I had received in the BAA finish line medical tent after running the 100th Boston in 1996. I was also glad to be “paying it forward” by offering a group of motivated students a learning opportunity that might be worthwhile for them. At my initial meeting with the diverse group of UMB volunteers, I learned that most were motivated to join in order to learn and use their developing skills to help exhausted or injured runners. Most were not athletes themselves and had little knowledge of the possible medical needs of endurance runners. To get the students prepared, I assigned them to read an article I had published in *Nursing Spectrum* (2004) on common conditions treated at marathons and medical tent operations, with the medical tent operation at Boston as the exemplar.

On April 15, 2013, at 7 am, I sat in the Hynes Auditorium with the young students on my team. All were excited to soon be at the finish line area, which I had promised was the place to be on “Marathon Monday” in Boston. We were ready to help in any way we could and the orientation that morning by the top-notch BAA medical team volunteer leaders instilled a sense of teamwork, responsibility, and

excitement in the over 200 medical sweep team volunteers attending. The presentation covered various communication and procedural policies that were to be followed and reviewed some of the BAA medical protocols and role responsibilities for care coordination. With almost ideal weather, it was clear that heat-related injuries would not be the concern they had been the previous year. We were ready! The white caps with the UMB logo we wore matched perfectly with the white medical volunteer jackets handed to us by the BAA as we got our zone assignments (location at the finish line area where we would each be stationed). As we split up, we made plans to meet later.

I joined my zone with a few of my students and other volunteers. It was quiet for a while, as expected, but we soon filled the silence with cheers as we heard that the elite runners had taken off from Hopkinton. The finish line then became the focus of attention. From where we were, a few blocks away in my zone, we could feel the excitement and watched as the growing throngs of spectators gathered trying to get as close as possible to the finish line. Before we knew it, the elite runners were being announced and there was energy and excitement in the air.

In preparation for the big day, I taught my students that around the 4-hour mark is when things start hopping at the finish line; we expected a steady increase in volume at about 3 pm. The crowd of spectators welcoming their loved ones from around the globe also grew. We were ready for our sweep team role of assisting those who looked like they might need help and provide it if we could, or transfer to the medical tent for treatment. Those with exercise associated collapse, severe muscle cramps, dehydration, dizziness, or the usual blisters or minor injuries would be taken to the tent.

There was no real preparation for what was about to happen. My students and I reacted as so many others did that day; we used our training and basic instincts in forming our responses, as we all were in different locations, in distinctly different situations around the finish area. Decisions were made and the BAA directions were followed when communications were restored. Some witnessed or assisted as those injured were cared for and transported to the tent and/or area hospitals.

In the time that immediately followed the blasts, my role shifted. It was a terrifying situation and like so many that day, after doing what needed to be done



The UMB nursing team at the 2013 volunteer Orientation at Hynes Auditorium.

in my zone, I had to calmly assist the remaining runners who had crossed the finish. All the while I was consumed with fear for my team's safety. We eventually regrouped and I tried to project the calm needed to reassure them as I lined them up in pairs of two—and kept counting them—as we made our way to safety.

I was overcome with gratitude when I finally knew the students were all physically unhurt, but then my concern shifted to their mental well-being. I was so grateful to reunite with my faculty colleague, Katie Kafel Williams, as we focused on the tasks of supporting the students and getting them to safety. Although each student was an adult who had chosen to sign up as a BAA volunteer, I felt tremendous responsibility for them.

The support of the BAA was superb. Their medical volunteer leadership offered both immediate and ongoing support and their resources focused on mental health and coping strategies. Our medical sweep captain reached out to me immediately after the events and worked with me to coordinate follow-up. Back on campus, we all struggled to process the events. We were completely devastated to learn that a former UMB student, Krystle Campbell, was one of the young spectators tragically killed at the finish line. Many students discussed having a hard time initially, mainly dealing with guilt and fear and feelings of extreme sadness, while others experienced immense anger. In the initial time period after the marathon, I was particularly shaken by the loss of such young lives and the close call of my students, many the same age as two of the victims (and of my own son). In the hours that followed, our volunteer team of students coalesced as we debriefed and supported each other. They cried together and worried about each other. Even as they struggled to sort through the events, and as we dealt with varying degrees of PTSD (including from anxiety, sleeping and eating difficulties, and hyperarousal) in the immediate time-frame, the students also felt highly motivated to do something meaningful. They went right to work designing and producing UMass Boston Strong t-shirts, selling them to raise money for the OneFund to help the many seriously injured from the bombing. They proudly raised \$10,000.

I was grateful to attend one of the number of highly professional debriefings for the volunteers organized by the BAA to offer support (for many days I had great trouble eating and sleeping). Mental health professionals from the armed forces expert in PTSD were brought in from Washington, DC, to lead the sessions. The BAA sent emails with updates and helpful

Even as they struggled to sort through the events, the students also felt highly motivated to do something meaningful.



Nursing students Spencer Gilfeather and Angela Pasqualone selling t-shirts to raise money for the OneFund.

resources on PTSD. Most of the students found that turning to their friends for support was most helpful, with many saying it was important for them to discuss their feelings with others on the team who understood what it was like. I felt ongoing responsibility for the well-being of each student and, in the initial days, attempted to assess needs and secure resources if needed. The university administration was extremely supportive to our team and others on campus who were also impacted; class schedules and deadlines were adjusted when necessary. Both informal and formal meetings of the team and subgroups took place on campus. Some turned to parents or other family members for support and some sought counseling from medical or mental health professionals. Later, after the stunning shutdown of the city aimed to capture the perpetrators, we went together to visit the make-shift finish line memorial that sprang up. It was a time to pay respect and grieve together. It was in those days that typical, PTSD was apparent.

Following the event, many students on the team described feeling a greater commitment to their career goals, confirmation of their career choice, and

eagerness to become a health care professional. Among comments made to me by students were that they had a sense of greater competence or confidence, as well as a heightened sense of resilience and strength.

Over the next several months, one at a time they came into my office and told me how they were now going to “be a better student,” how hard they would study, how impressed they were seeing the *real* nurses in the medical tent who sprang into action and knew what to do, and how they were even more committed to their career choice. They also conveyed how they now appreciated “what really mattered” and how they could help in the future as nurses. Some expressed a sense of great pride in their choice of career as a result of the role models they observed during the experience, as well as a greater sense of responsibility. I, too, felt renewed commitment to my work and to others.

Post-traumatic growth is defined as positive psychological change experienced as the result of the struggle with highly challenging circumstances. Areas of this growth include (a) new possibilities in career, interests, or purpose; (b) relating to others with greater intimacy, openness, and compassion; (c) accessing existing resilience or developing personal strength as a result of the tragedy; (d) developing a greater appreciation for the meaningful aspects of life, often by shifting daily priorities; and (e) deepening one’s spiritual beliefs or changing one’s philosophical assumptions (2).

We went to the Hynes Convention Center the following year together for a somber, moving remembrance and inspiring tribute to all those who were affected that day. We worked with UMB

trustees to plan a remembrance event for the UMB community and raised money for a scholarship in memory of Krystle Campbell. I was thrilled to have my friend, the renowned runner Kathrine Switzer, speak to the UMB community on “resilience.” She inspired us and helped us to heal and support each other as we honored the tragic loss of our alumnus. In April of 2014, many of us returned to the finish line as BAA volunteers on the medical sweep team. We rejoiced in the sheer normalcy of the day and were glad to be of service to exhausted or injured runners. Two of the students, who previously volunteered with us, were motivated to train and run the 2014 Boston Marathon for the OneFund, and we were there to celebrate them at the finish.

Countless lessons were learned from an experience no one ever expected. Many have already been reported at conferences and in publications. For example, at the American Public Health Association’s annual conference held six months later in Boston, public health and disaster management experts reviewed what was learned from the response from the mass casualty perspective; my students and I attended the special session to learn more about how the response was assessed. Numerous lessons learned from the medical tent and area-wide hospital response were published in the *New England Journal of Medicine* (3) and medical protocols were reviewed and updated as a result. The lack of tourniquets lamented by one of my students was identified as a need. We were invited and attended a conference organized by the state Association of Operating Room Nurses (AORN) held at an area hospital in 2014 to review the response of the



UMB students with Adrienne (second from right) at the “Walk to Remember Krystle Campbell” in 2014.



Adrienne (third from right) with UMB nursing students returning as volunteers in 2014.



Adrienne with former Marine and 2013 nursing student volunteer Spencer Gilfeather after he crossed the 2014 finish line in his first marathon. He will be running the Boston Marathon again this year.

operating room nurses at all the affected hospitals. Consequently, we learned what decisions were made and how resources were deployed to treat injured patients, adding knowledge to our experience.

While knowing how important volunteers were to me personally as an athlete, the unique role of medical volunteers and the teaching and learning opportunity offered by this participation was never more apparent to me than at the 2013 Boston Marathon. The BAA sets the gold standard for medical tent operations and the volunteer talent assembled is nothing short of remarkable. We learned about inter-professional teamwork as physicians, nurses, athletic trainers, EMTs, physical therapists, and others came together to help under the most challenging of conditions. My students learned from true role models who demonstrated compassion, courage, resourcefulness, and skill. They were able to help in ways both large and small and recognized the importance of teamwork. We learned that preparation and training are never to be underappreciated. We learned to trust the direction provided by others and to step up in whatever way makes sense. I also learned that teaching and working together to offer service is tremendously enriching. And while credentials do not confer immunity from PTSD, it is surmountable and I continue to volunteer at race events in New York and Boston. I also continue to offer this experience to eager students.

Five years later, students on the team inspired at

Boston have gone on to work in the ER, ICU, and other critical settings. Many continue to volunteer and some have become runners as well.

And, I will once again be volunteering at the finish line this Patriot's Day!

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Dr. Adrienne Wald is an assistant professor of nursing in the School of Nursing and Healthcare Professions at the College of New Rochelle in New York where she coached the College's women's cross country (D3) team for five years. She is a "pre-Title IX" but longtime runner (having run in a dozen marathons from NY (1984) to LA, with six Boston qualifiers during her 40s and 50s). She has been an age-group competitor running the mile to the marathon with the Westchester Track Club, and has been a race director and volunteer coach. Dr. Wald's doctorate is from Teachers College Columbia University and she has published physical activity research.

TALKING ABOUT TRAINING

When is the Best Time to Consume Protein for Training and Competition?

By Fred L. Miller III, PhD, ACSM EP-C, CSCS, NCSF-SNS

The answer to the question posed in this article's title may vary based on whom is asked. For example, a doctor may say, "There is no best time to consume protein. Just consume sufficient equal amounts throughout the day." You might also search Google for the answer but find many differing opinions. For example, one website may state, "You should consume 20 grams of protein immediately after your workout." Another website may state, "You should consume protein before and after your workout." What is the correct answer? This article will help you decide.

Daily Protein Requirements

Prior to discussing protein timing, let's first review daily protein recommendations. I discussed this topic in the fall/winter issue of *Endurance and Sports Medicine* (1), focusing on calculating protein needs based on body weight and physical activity level. For example, the daily protein needs for a 154-pound (70 kg) sedentary person is approximately 56 grams. If this person started endurance training, the requirement would increase to a range of 84 to 98 grams. If the person is a runner and also dieting, the requirement would increase to a range of 105 to 140 grams. Tables 1 and 2 will help you calculate your daily needs.

Table 1.
Daily Protein Requirements Based on Physical Activity Level

Physical Activity Level	Grams of Protein/ kg BW/Day
Sedentary/No Exercise	0.8
Strength Training, Gain Muscle	1.6 – 1.7
Endurance Training	1.2 – 1.4
High Intensity Interval Training	1.4 – 1.7
Runner Dieting	1.5 – 2.0



Table 2.
Calculation of Protein Requirements: 154-lb Person Training for a Marathon

Calculation Steps	Grams of Protein/kg BW/Day
1) Convert body weight from lbs to kg	$154/2.2 = 70$ kg
2) Calculate protein needs based on physical activity level (endurance training)	$70 \times 1.2 = 84$ grams (lower range) $70 \times 1.4 = 98$ grams (upper range)
3) Calculate protein needs based on runner dieting.	$70 \times 1.5 = 105$ grams (lower range) $70 \times 2.0 = 140$ grams (upper range)

Now that you know how to calculate your daily protein needs, the next step is to figure out the best time for its consumption.

Where to Look for Answers

Numerous sources of information are available to us. Often times, we search the Internet. Sometimes we ask people whom we believe should know

the answer. For some, a book may be the desired source of information. Regardless of the mode, it is always best to select a “good” source. But what is a good source? It’s one that is credible, trustworthy, reliable, and accurate. Research journals that include articles based on research studies are a good source. Research journals that include peer-reviewed studies are even a better source.

Despite various available good resources, how do you think most people get their answers? They search on Google or ask a knowledgeable friend. Although there is reputable information posted on the Internet, I am skeptical about using it as a primary source. It is not regulated and information can be exaggerated, misleading, or just plain incorrect. Unless the Internet information is supported by research, I am hesitant to believe it. This same apprehension applies for an answer from a friend, unless the friend is an expert on the topic. Therefore, I consider it best and in one’s favor to find answers in research journals. With research, especially if it is peer-reviewed, I feel confident in the information.

But for curiosity sake, let’s compare Google’s answer with research’s answer on the question, “When is the best time to consume protein?”

Google’s Answer on Protein Timing

When searching on Google for “When is the best time to consume protein?” I was shown about 1,190,000 results. Wow! That is a lot! I don’t think I or anyone else has time to review all these results, let alone talk about them in an article like this. So, let’s just review the top four results and see what they say about protein timing.

The first result listed is a website called “The Protein Works.” On the website it states, “The best time to take whey protein is within one hour of finishing your workout to help the recovery of your muscles.” Just like that, you have an answer to the question. You can now move on with your life. I am guessing, though, that you may be like most people and want to look at a few more results before reaching your conclusion for this question. Plus, this

first result is from a protein website and, therefore, very likely a little biased towards protein. So, let’s look at the next result.

The second website listed is “Men’s Fitness.” On this site Chris Jordan, CSCS, states the following, “It is crucial to consume protein within 30 to 45 minutes after your workout—but that’s at a minimum.” This answer agrees with our first result which states that post-workout protein consumption is best. However, Men’s Fitness indicates that protein should be consumed within 30 to 45 minutes versus one hour and, thus, not 100% in agreement. Also, the individual providing advice on the subject, Chris Jordan, has a very credible certification (CSCS) but it is for strength and conditioning, not nutrition. This demonstrates an example of a supposed expert

providing advice. Let’s move on and examine our next result.

The third website is “Bodybuilding.com.” Midway down the article, under the bold heading, “The Best Time to Take Protein,” it states “Getting adequate protein matters more than when you take it. But once you’re sure you’re getting enough, there is definitely the right type of protein for the right time of day.” Thus, this website addresses sufficient

consumption as most important, but does then state there is a “right time” and “right protein.” The right times are shown as 1) within 30 to 45 minutes after a workout, 2) before a workout, 3) right before bed, and 4) right upon waking. I like this website because it supports its comments with research studies; however, the article does challenge results concluded from one meta-analysis. It states that “although the results poked a hole in the idea of an “anabolic window” that lasts 30-45 minutes, this is still a good time to have a shake.”

The fourth website is “naturesway.com.” I really like the website statement near the top which reads, “This commonly asked question has no universal answer....the best time to take protein depends on you and your specific health goals.” This article immediately states that “there is no one size fits all,” thus, you need to know your goal. For example, it states that if your goal is weight loss, then

This commonly asked question has no universal answer.... the best time to take protein depends on you and your specific health goals.

Table 3.
Top Four Google Results

Website Name	Link
The Protein Works	https://www.theproteinworks.com/thelockerroom/article/tpw-ninja/when-best-time-take-whey-protein
Men's Fitness	https://www.mensfitness.com/nutrition/supplements/best-time-day-drink-your-protein-shake
Body Building	https://www.bodybuilding.com/fun/lebrun19.htm
Nature's Way	http://www.naturesway.com.au/article/best-time-take-protein/

consuming protein in the morning and throughout the day is best. If your goal is recovery, then post-workout and right before bed are the best times to consume protein. I also like that this website supports most of their comments with research studies.

Table 3 shows links to the websites I mentioned. As noted, Google is often the first place people look for answers and, just as I did, they find many of them. We looked at just the first four websites; some simply made a recommendation while others supported their recommendations with research. However, these websites are *interpreting* research study findings. What is better than someone's interpretation of a research study? How about reading the research study yourself? In other words, "Why not go to the source?" So, let's do that by reviewing what some research studies say about protein timing.

Research's Answer on Protein Timing

Overall, research study results are mixed as to whether there actually is a best time to consume protein. For example, two studies reported that consumption of protein during exercise improved performance (2,3), whereas two other studies reported no performance effect (4,5). Just based on these four research studies, it can be concluded that there is debate as to whether or not consuming protein during exercise affects overall performance. Based on my interpretation of the studies, differences were not due to energy availability. In fact, in one study (Cermak et al., 2009), men ingested an extra 20g of protein but this did not alter specific markers of skeletal muscle energy delivery.

Two studies found consumption of protein after endurance training stimulates muscle protein

synthesis (MPS) (6,7). However, a recent systematic review reported no beneficial effects in performance when protein supplements are consumed prior to, during, or after a bout of endurance or resistance exercise (8). The recommendation would be to consume some protein soon after working out to enhance MPS and thus adaptation/recovery (9).

A recent meta-analysis concluded that total protein intake was most important and that timing is not critical (10). The meta-analysis included 23 randomized controlled or crossover trial studies involving only protein timing. Subjects included trained and untrained (resistance training) women and men from young to old. In contrast, another recent meta-analysis concluded pre- and post-workout protein consumption was important and led to increases in performance in weightlifters (11). Finally, a third meta-analysis reported protein supplementation may improve muscle mass, performance, and aerobic and anaerobic power when training is adequate (12). This meta-analysis included 38 studies involving trained and untrained men and women ranging in age from 18 to 50 years involved in resistance training or aerobic training.

Recent studies have found that consuming protein with carbohydrates may be most beneficial. For instance, one study reported that post-consumption of protein may enhance adaptations, but only if consumed with carbohydrates (13). Another study reported that consumption of carbohydrates and protein increase time to exhaustion in cycling endurance (2).

Conclusion

Is there a best time to consume protein? Based on the Google search and research studies mentioned above, the most reported best time is post-workout

(within 30 minutes). However, because not all the online searches and research studies reached this conclusion, my own answer is “possibly.” I advise first to focus on consuming sufficient protein daily and in relatively equal amounts throughout the day. Then decide on whether to consume a small amount (e.g., 20 grams) post-workout or at another time (e.g., pre-workout or before bed). It may be that you had a very positive training experience consuming protein pre- and post-workout, which then I would suggest it is probably best to continue with that timing. Whether timing is affecting training physiologically is questionable as we know that many factors affect training, recovery, and performance during competition. If you decide to consume protein pre- or post-workout, I encourage you to consume it with carbohydrates, as studies have found this to be beneficial (2,13).

If you decide to consume protein pre- or post-workout, I encourage you to consume it with carbohydrates, as studies have found this to be beneficial.

It was my desire in this article to provide you with a crystal clear answer to the question, “Is there a best time to consume protein?” However, as you see by my conclusion of there is “possibly” a best time for protein consumption, the answer is not clear and the topic is very debatable and depends on energy availability. Until more research studies can be conducted on this topic and a consensus conclusion found, I encourage you to focus more on consuming sufficient protein daily and equal amounts throughout the day, even if it means consuming a little protein pre- and/or post-workout.

Dr. Fred L. Miller, III, is an associate professor of Exercise Science, Department Chair, and Head Cross Country Coach at Huntington University in Indiana. He is a long-time distance runner who has completed over 500 races ranging in distance from the 5K to the Marathon. He has completed 20 marathons (19 of those under 3 hours), winning the October 2015 Indianapolis Marathon in 2:41. Dr. Miller is an American College of Sports Medicine member, Certified Exercise Physiologist (ACSM C-EP), National Strength and Conditioning Association (NSCA) member, Certified Strength and Conditioning Specialist (NSCA-CSCS), National Council for Strength and Fitness (NCSF) member, and a certified Sports Nutrition Specialist (NCSF-SNS).

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Is There An Ideal Running Form?

by Thomas C. Michaud, DC

Making a few small changes in the way you run can make you faster, more efficient and possibly less injury-prone. But how do you know which changes to make?

The best running coaches in the world continually have their athletes work on their running form, either through daily drills or through significant biomechanical adjustments. Nike Oregon Project coach Alberto Salazar is famous for changing everything from the tilt of a runner's pelvis to the position of his or her thumbs.

From a biomechanical perspective, it makes sense that nearly every runner has some slight imperfection in form that can detract from optimal performance. Think of how automakers blow streams of smoke over a car's exterior in a wind tunnel to identify design inefficiencies that could result in reduced gas mileage. As related to running, identifying and correcting slight biomechanical glitches should theoretically improve efficiency and increase speed.

With more than 50 percent of runners getting injured each year, the notion that you can reduce your risk of injury while becoming faster and more efficient is definitely appealing. The question is, do claims of improved efficiency and reduced injury rates have merit?

In the past decade, several studies have evaluated two of the most popular running form techniques, the Pose Method and Chi Running. In 2004, the prestigious journal *Medicine and Science in Sports and Exercise* published a paper in which 20 runners with heel-striking gaits were instructed to run using the Pose technique. Biomechanical analysis revealed that compared to conventional heel-toe running, Pose running resulted in shorter stride lengths and smaller vertical oscillations of the pelvis. Just as Dr. Nicholas Romanov, founder of the Pose method suggested, Pose runners reduced the magnitude of the initial impact force and also reduced stress on the knee. The only downside was that the Pose runners had increased stress at the ankle.

The results of this study were similar to a more recent study comparing impact forces and movement differences between conventional heel-strike runners and runners experienced in Chi running. As with the Pose study, the Chi runners

had significant reductions in initial impact force and knee stress, but had to absorb more force with the ankle. Regardless of the added stress on the ankle, these two studies seem to confirm that Chi and Pose running do what they say: reduce initial impact force while also lessening stress on the knee.

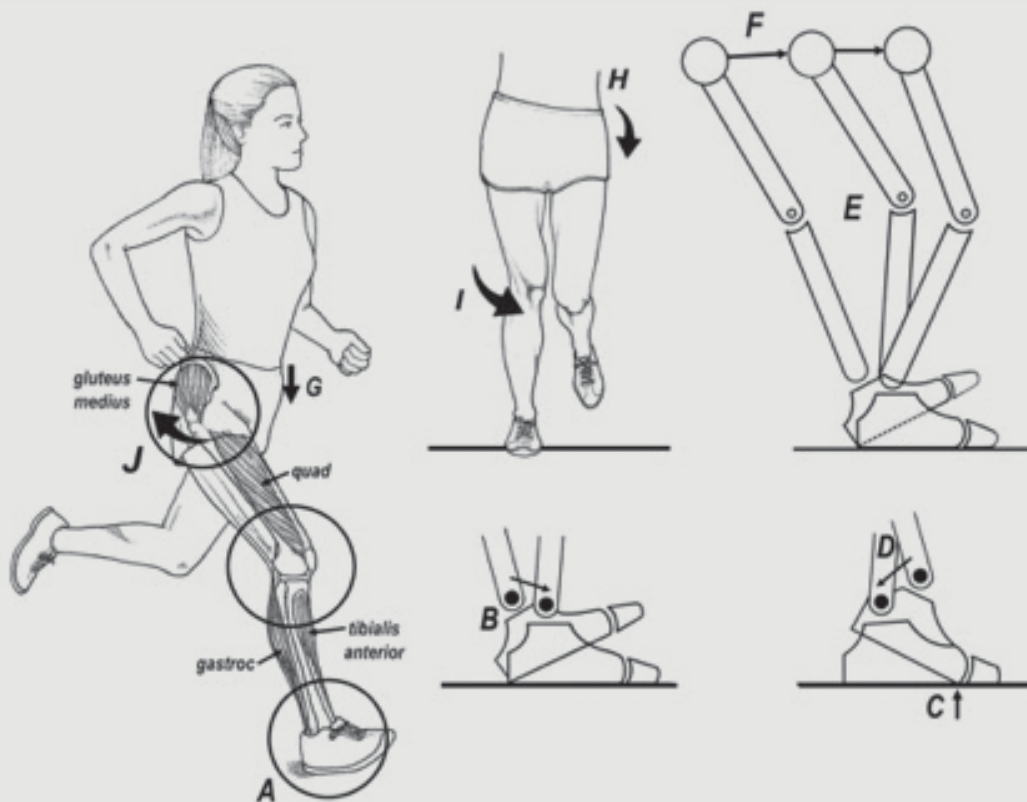
A problem with both of these studies, however, is that the reduced impact forces and lessened knee strain associated with Chi and Pose running most likely had nothing to do with the changes in running form and everything to do with the fact that the Chi and Pose runners were trained to run with shorter

The reason stride length is so important is because impact forces are stride-length dependent: the shorter you make your stride, the lower the initial impact force will be.

stride lengths. If the heel-strike runners would have shortened their strides the same amount as the Chi and Pose runners, they more than likely would have had the same reduction in impact forces, even if they were running with the worst running form possible. The reason stride length is so important is because impact forces are stride-length dependent: the shorter you make your stride, the lower the initial impact force will be. In fact, in 2011, researchers from the University of Wisconsin proved that, regardless of running form, runners who decrease their stride length while increasing their cadence can maintain the same running speed while reducing impact forces by as much as 20 percent. Translated: Rather than spending years trying to master a specific running form, you can dramatically reduce impact forces by making the simple changes of reducing your stride length and increasing your cadence.

You can only shorten your stride length and increase your cadence so much, however. Many running

Figure 1.
Joint and Muscle Interaction Necessary to Absorb Force



Heel Strike. Initial contact (A) can be made with the heel, midfoot or forefoot. The upside of a heel contact is that it reduces stress on the Achilles tendon and arch and allows the foot to smoothly roll forward (arrow B). The downside is that a heel contact increases force absorbed by the knee.

Forefoot Strike. Forefoot contact points (C) allow the gastroc muscle to absorb force, reducing stress absorbed by the knee by as much as 50 percent. The downside of the forefoot contact is that it can overload the Achilles tendon and the metatarsals. Also, because the initial point of contact acts as a pivot during ground contact (arrow), forefoot contact points cause the heel to initially drop down and back (D), temporarily acting as a brake.

Bent Knees. Once past the ankle, impact forces travel at about 200 miles per hour into the knee. In addition to allowing the quad to absorb force, bending the knee (E) prevents the hip and pelvis from moving up-and-down too much (F), which is important for injury prevention and efficiency.

Gluteus Medius. The gluteus medius muscle is also important for shock absorption because it prevents the opposite hip from lowering (G).

Pelvis and Knee Rotation. The best runners maintain their pelvis in an almost horizontal line, with their knee pointing straight forward. In contrast, runners with poor form allow their opposite hip to drop (H) and their knee to twist in (I). Excessive inward rotation of the knee is one of the worst errors in running form and should almost always be corrected with gait retraining (i.e. treadmill running in front of a mirror while deliberately keeping your knees moving in a straight line) and specific strengthening exercises.

Hip Rotation. Though rarely discussed, backward rotation of the hip at impact is the body's most important shock absorber. Excessively stiff and/or weak hips can lead to injuries by limiting the ability of the large hip muscles to absorb shock. Because of this, world-class runners spend a lot of time keeping their hips flexible and strong.

experts tell you that you can run faster and more efficiently by only increasing your cadence. This is not the case. Rapidly accelerating and decelerating each leg causes the hip muscles to burn so many calories that the metabolic cost of running (the amount of caloric energy required for those movements) skyrockets. Because distance runners can't afford to spend any extra energy getting to the finish line, they almost always increase stride lengths when they need to run faster. In a classic study evaluating stride lengths and cadences at different running speeds, physiologist Peter Weyand and his colleagues showed that experienced runners increase from a slow jog to a 6:45 minute-mile pace by increasing stride length only. After that, faster running speeds are achieved by mostly increasing stride length with only slight increases in cadence. It isn't until you reach an all-out sprint that stride length is maximized and the final burst of speed is accomplished by a rapid increase in cadence. To sum it up: moving the swinging leg back and forth is a metabolically expensive option that you try to avoid.

Fast runners have to make ground contact with the foot positioned well in front of them to achieve a longer stride length. The more forward contact point produces an unavoidable increase in impact forces as the lead leg acts as a brake to stop the runner's forward motion. Unfortunately, these longer stride lengths increase impact force from 1.5 to 5 times a runner's body weight with each foot strike, translating into an additional 5,000 tons of force that the elites must absorb during the course of the marathon. Despite the added stress, however, these athletes manage to run 26.2 miles with relatively few signs of distress.

Contrary to popular belief, studies involving thousands of athletes show there is no difference in injury rates between runners making initial contact with the heel and those striking with a more forward contact.

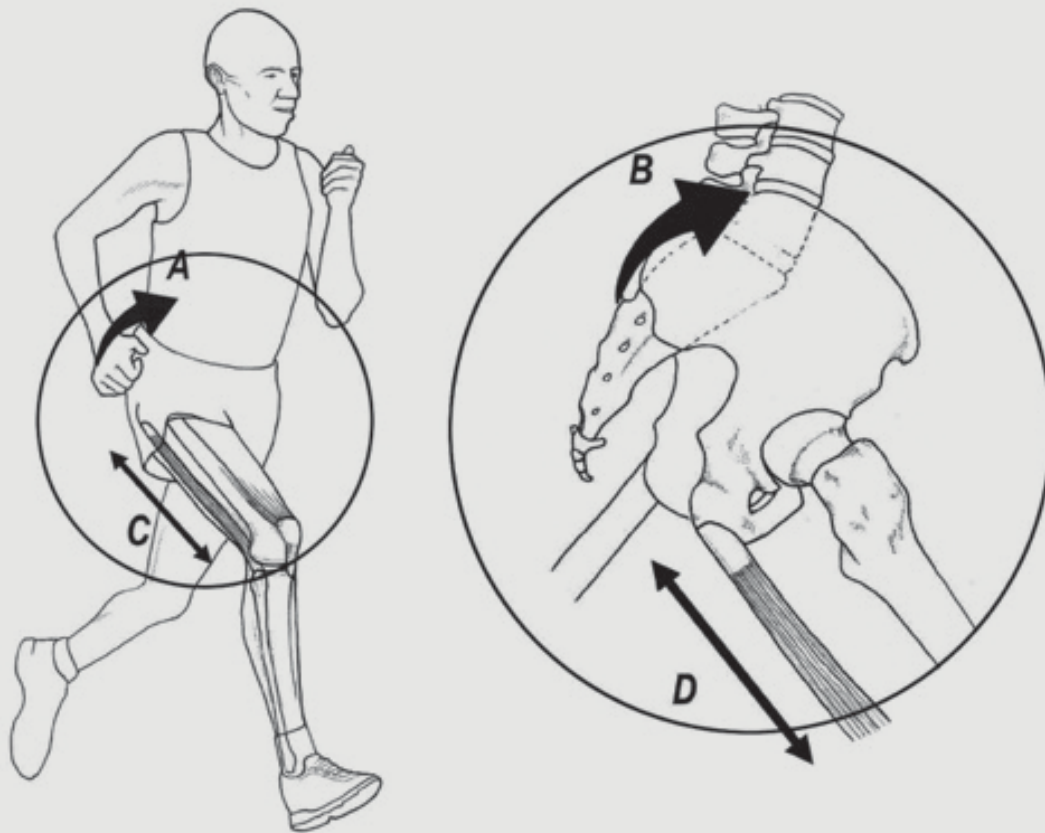
Elites prove that it's not the degree of impact force that does the damage—it's how you absorb the force. Think about the way you would catch a baseball thrown at you at 90 mph with your bare hands; if you held your arms and shoulders stiff, the ball might break your hand. Conversely, if you move your shoulders, elbows and wrists just right, you can catch even the fastest pitches without a problem because you're softening the impact. That's essentially what elite runners do: they smoothly absorb impact forces that would break bones in recreational runners by moving their feet, legs, knees and hips with the perfect series of movements.

Putting aside the incorrect notion that in order to run fast all you need to do is increase your cadence, another common misconception regarding running form is that it is always better to make initial ground contact with the mid-foot or forefoot—that striking the ground with your heel should be avoided at all costs. Contrary to popular belief, studies involving thousands of athletes show there is no difference in injury rates between runners making initial contact with the heel and those striking with a more forward contact. The vast majority of recreational runners are actually more efficient when heel striking. In a recent study evaluating efficiency while running at different speeds, researchers from Spain proved that compared to mid-foot and forefoot strikers, slower recreational runners are almost 10 percent more efficient when striking the ground with their heels. The benefits associated with heel striking continue until runners reach the 6:25 minute per mile pace, after which, heel and midfoot contact points are equally efficient. The reduced efficiency associated with midfoot and forefoot contact points while running at slow speeds explains why Pose Runners, despite having reduced impact forces, are considerably less efficient than conventional heel-strike runners.

Studies comparing impact forces associated with different contact points consistently show that the same force is absorbed by your body, regardless of how your foot strikes the ground. The force is just absorbed by different joints. Runners who strike the ground with the forefoot absorb more force with their arches and calves, while runners making initial contact with the heel absorb more force with their knees. Force absorption at different locations explains the higher prevalence of Achilles and plantar fascial injuries in midfoot and forefoot strikers and the higher prevalence of knee pain in heel strikers. This is the biomechanical version of

Figure 2.

By leaning slightly forward at the hips (arrows A and B), runners use their upper hamstrings (C and D) to absorb force that would normally be absorbed by the knee. Some great research proves that the world's best runners make initial ground contact with their upper bodies tilted slightly forward, while less efficient runners contact the ground with their spines almost vertical.



“nobody rides for free.” If you’re a fast runner and you have a tendency for knee pain, you might want to consider gradually transitioning into a more forward contact. Conversely, if you’ve been plagued by chronic Achilles injuries, a shift to a heel-first strike could reduce your potential for reinjury.

Keep in mind that while making subtle changes in running form can reduce your potential for injury, the majority of research suggests that making even a slight change in the way you run will reduce your overall efficiency.

A recent paper published in the *Journal of Strength and Conditioning* showed that by incorporating explosive plyometric drills into their routines, runners were able to improve endurance 6 percent across three different running speeds with a 3

percent increase in 3K race performance. The authors attributed the improved performance and speed to an enhanced ability of muscles and tendons to store and return energy following completion of the plyometric drills.

In another paper, Australian researchers had high-level runners perform a series of six, 10-second strides while wearing a weighted vest (fitted with 20 percent of their body weight). A control group of runners performed the same running drills without the weighted vests. The researchers noted that shortly after performing the drills, the runners who performed the drills while wearing the weighted vests had huge improvements in peak running speed and economy. Apparently, the weighted vests allowed for faster running times and

improved efficiency because the vests forced the runners to stiffen their knees and hips in order to absorb forces associated with carrying the added weight. The increase in leg stiffness resulted in large improvements in performance and economy because stiff muscles are more efficient at storing and returning energy. The improved form persists even after the weights are no longer worn. Runners can increase leg stiffness after just a few weeks of strength and plyometric training, and by performing high-intensity uphill interval training.

It's hard to argue with the research on running form. If your goal is to become fast and efficient, be cautious about making significant changes in form because you intuitively pick the running style that works best for you. Conversely, if your goal is to remain injury-free, the easiest way to do this is to reduce impact forces by shortening your stride length and increasing your cadence. Because the best predictor of future injury is prior injury, you should also develop a running style that accommodates your prior injuries; e.g., runners with a tendency for knee pain should consider making initial ground contact on their midfoot, while runners with a history of Achilles injuries should strike the ground heel first.

The bottom line, in spite of what many running experts tell you, you will always be the best judge of choosing the running form that is right for you.

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BOOK REVIEW

The Women's Guide to Health: Run Walk Run, Eat Right, and Feel Better

By Jeff Galloway and Ruth Parker

Paperback, 211 pp, Meyer & Meyer Sport, December 2017

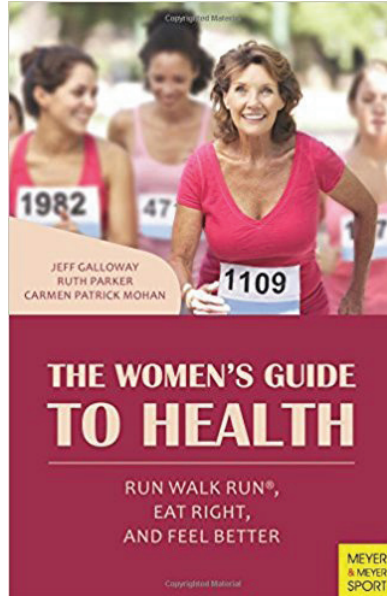
Reviewed by Cathy Fieseler, MD

The practice of medicine has become very complicated since I graduated from medical school more than 30 years ago. New diagnostic modalities, thousands of new medications, and an unending stream of changes in recommended screening and treatment of medical conditions require continuing education for providers. Insurance changes and electronic medical records add to the demands on a provider's time. Many CME forms at medical conferences ask about the constraints to changing provision of medical care and the usual response is "lack of time."

Providers spend a great deal of time treating illness and therefore have little time to promote wellness, but that should be our goal. Improving lifestyle through exercise and a healthy diet is a treatment for and prevention of numerous chronic medical conditions. Counseling patients on this takes a lot of time and this just isn't available in a busy practice. This is where *The Women's Guide to Health: Run Walk Run, Eat Right, and Feel Better* by Jeff Galloway, Ruth Parker, and Carmen Patrick Mohan comes into play. This book is geared towards women, though the basic principles hold true for both genders.

The book provides journal pages to be used to track progress and act as a source of accountability. The purpose of the journal and an explanation on completing it is outlined in the first chapter.

The second chapter discusses how to get started in a run walk program, including clothing, issues such as menses, and running hazards like dogs and motor vehicles.



The next chapter presents three different run-walk programs depending on the level of fitness of the participant. Each program lasts 30 weeks and each workout is described in a chart. The participant is encouraged to become a lifelong exerciser. The introduction to each program provides the same information, so is redundant if someone is reading the entire book. The participant is encouraged to take breaks and avoid straining to decrease the risk of injury and increase the likelihood of continuing the program.

Food is the next topic discussed. A scoring system is outlined giving points for healthy foods and subtracting points for less desirable substances. This is easy to understand without having to count calories. The only problem that I noted was almond milk being listed as a source of protein, since it only has 1 gram per serving.

The remainder of the book addresses common questions that arise and discusses the impact of these lifestyle changes on chronic medical conditions.

Overall, this is an easy-to-read book that health care providers can recommend for female patients interested in improving their health. There is a wealth of information on how to start a run-walk program and improve nutrition that would be impossible to cover during a clinic appointment. The authors recommend that the participant discuss the program with her provider and bring her journal to clinic appointments. The book is a nice addition to clinic visits to promote wellness to patients.

IIRM Ambassador Program

The International Institute for Race Medicine is proud to announce its new Ambassador Program. We are recruiting designated individuals from a variety of countries to represent the IIRM as we expand our global efforts to share evidence-based recommendations for the medical care provided at endurance races. This program will also serve as a platform to learn from others who work in the same field, while providing networking opportunities for our members. We hope this will also help us further our mission by developing a collective voice within the race medical and public safety communities.

Key tasks of the IIRM Ambassadors will be to work with medical directors to help them manage their role as an IIRM member and guide them as they disseminate medical education to their volunteers, help create new learning opportunities through facilitation of live and video presentations, and work with IIRM leadership to expand educational outreach to race participants.

We are proud to introduce our first two IIRM Ambassadors, Yuri Hoskawa, PhD, ATC, and Jannelene Killops, MD. Dr. Hoskawa is former President of Communication and Education at the Korey Stringer Institute (KSI) in Storrs, Connecticut. Following recent completion of her Postdoctoral Fellowship at KSI, Dr. Hoskawa relocated to Japan to become Assistant Professor at the Ritsumeikan University in Shiga. Her research interests include prevention and education of sudden death in sport, establishing best practices in road race medicine, development of regional-specific



Yuri Hoskawa, PhD, ATC



Dr. Jann Killops (third from left) at the Excellence in Race Medicine conference in Cape Town, South Africa, with (from left) Dr. Mats Borjesson; Chris Troyanos, ATC; Prof. Christa Janse van Rensburg; Dr. Courtney Kipps; and Dr. Martin Schwellnus.

heat guidelines, and exploring the roles of genetics in the susceptibility of exertional heat stroke. She also serves as a science advisor for Sport Safety Japan, NPO, and is a member of the Korey Stringer Institute Medical & Science Advisory Board.

Dr. Jannelene Killops, a sports physician in Cape Town, South Africa, who also has a Diploma in Anaesthetics and in Mental Health, heads up the sports medicine division at Mediclinic Southern Africa. She is the race medical director for large-scale medical events, including the Cape Town Cycle Tour, Absa Cape Epic, and Cape Town Marathon and is an instructor for World Rugby on the ICIR course and for the American Heart Association. Her passion about promoting safety at mass participation events and research in the effectiveness of pre-race screening at mass participation events led her to help organize the first international conference for Excellence in Race Medicine, held in Cape Town in September 2017. Dr. Killops hopes to “unify the standards set at mass participation events across the world and use the knowledge sharing in this unique field to make races safer for all participants.”

Additional Ambassadors, including Dr. Lowell Greib of Ontario, Canada, will be introduced in upcoming issues of *Endurance and Sports Medicine*. If you are interested in learning more about the program, please write to info@racemedicine.org.

SAVE THE DATE!



**IIRM 2018 Sports Medicine
Conference Series:
Washington, DC
October 26-27, 2018**



Presented by the International Institute for Sports Medicine, sponsored by MedStar Sports Medicine, and held in conjunction with the Marine Corps Marathon and Uniformed Services University Consortium for Health and Military Performance (CHAMP).

Location in Washington, DC, to be announced.

The agenda, including multiple workshops focusing on team-based analysis of “medical tent scenarios,” will be available soon on www.racemedicine.org. An announcement will be sent to IIRM members via email when the agenda is posted.

Attendees have the option of running the SOLD-OUT Marine Corps Marathon* (limited number of entries) or working in the medical tent for additional CME credit hours.

*If you are interested in running the marathon, please contact Barbara Baldwin, MPH, at bbaldwin@racemedicine.org.



Check out our new blog, authored by Marine Corps Marathon Medical Coordinator Michele “Shelly” Weinstein, PT, MS, SCS, ATC, USN Retired. Shelly is also co-owner of Cogent Steps, LLC (medical education and emergency management education), an emergency response instructor for the American Physical Therapy Association’s Sports Section, and faculty member of the US Navy Sports Physical Therapy Residency. To view or contribute to the blog, go to <https://racemedicine.blogspot.com>.