"Back to the Future"

A Kit Kat Essay
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Humans have engaged in endurance running for millions of years, but it was not until the early 1970's that the modern running shoe was mass produced. For most of human evolutionary history, runners were either barefoot or wore minimal footwear, such as sandals or moccasins, with smaller heels and little cushioning in contrast to modern running shoes. So how did runners cope with the impact caused by their foot colliding with the ground before the invention of the modern shoe? How did barefoot endurance runners survive? And if protection and cushioning of today's running shoe have improved, why haven't injuries among runners and joggers decreased? In order to understand how we humans ran comfortably and safely before the invention of shoes, and to get a sense of the evolution of running as we know it today, we need only go "back to the future."

Running marathons was once considered both an odd and relatively dangerous activity. Most have heard of the "Battle That Changed Human History" in the year 490 B.C. The Persian army wanted to expand their territory and move into Europe. The Persians landed a large force just outside of Athens on the plains of Marathon, and prepared to attack. Vastly outnumbered, and desperately needing the help of Sparta's distant military base, the Athenian generals dispatched a soldier, Phidippides, a professional runner by background, to Sparta to ask for help. The 140 mile course was mountainous and rugged. It supposedly took Phidippides nearly 36 hours to complete the journey from Athens to Sparta.

Sparta agreed to help, but said they would not do so, due to religious laws, until the moon was full. Phidippides ran back to Athens (another 140 miles) with this news. This left only the small Athenian army to face the Persian invaders. They marched to the plains of Marathon to prepare to battle the Persians. The Athenians launched a surprise attack, and by the end of the day, the

surviving Persians fled. However, they headed south towards Athens to attack the city by sea before the Greek army could reassemble there.

Phidippides was again called upon to run, this time to Athens, which was 26 miles away, to carry the news of victory and to warn the city of the impending Persian attack. Despite his fatigue from his runs to and from Sparta, and having fought all morning in heavy armor, Phidippides nonetheless reached Athens in roughly 3 hours, delivered his message, and then died shortly thereafter from exhaustion. Sparta and other Greek provinces eventually came to the aid of Athens, were able to turn back the Persian attempt to conquer Greece, and thus, changed the course of human history.

To recognize Phidippides' efforts, the modern Olympic Games introduced a marathon race initially consisting of 40 kilometers or approximately 24.5 miles. At the 1908 Games in London, the marathon was changed to a distance of 26 miles in order to cover the ground from Windsor Castle to White City

Stadium, and an additional 385 yards was tacked on so the race could finish in front of King Edward VII's royal box. Thus was born the 26.2 mile distance, officially first recognized during the 1924 Olympic Games in Paris, that we today refer to as the "official" marathon distance.

The increasing popularity of marathon running is today's testament to the human capability and capacity for endurance running. Validating this growing popularity of distance running, more than 500,000 marathoners crossed the finish line this past year, and just in the United States, representing an increase of more than 25% over the past 10 years. These numbers exclude the "ultra-marathoners" who run races covering 100 miles or more. In Chicago alone, more than 45,000 participants line up for the start of the Chicago Marathon, while more than 40,000 runners annually converge upon New York City to participate in the NYC Marathon on the first Sunday in November. Tens of thousands of entries are turned away from these races each year.

At the same time that the popularity of long distance running has dramatically increased around the world, injury rates have also climbed, with reports that 90% of those who train for the 26.2 mile race sustain injuries in the process. Today's data suggests that between 65% and 80% of all runners - joggers and elite runners alike - are injured every year. According to studies by Dr. Irene Davis, formerly the Director of the Running Injury Clinic at the University of Delaware and Stephen Messier, Director of the J. B. Snow Biomechanics Laboratory at Wake Forest University, such figures "have been consistent since the 1970s." In the past 40 years, no study has **ever** shown that highly touted innovations in running shoes or custom-molded orthotics have done anything to reduce injuries.

Instead, more recent scientific studies, along with a more visible, best-selling book entitled *"Born to Run"* authored by Christopher McDougall and published in 2009, explore the injury explosion among long distance runners. McDougall does so by examining the incredibly unique world of the Tarahumara Indians,

a tribe that is known for their abilities to run extraordinary distances in little more than thin-soled sandals. McDougall's conclusion: we don't need smarter shoes; we need smarter feet that know how to run smarter.

The published scientific evidence and studies conducted within the past 5-6 years have confirmed McDougall's experience and conclusions. These studies, which examine characteristics unique to humans, conclude that endurance running played an important role in our evolution, while examining the causes of the increasing numbers of running injuries

McDougall, who describes himself as a "broken-down, middle-aged, ex-runner," journeyed to Mexico's Copper Canyon in 2005 to observe the Tarahumara, who run 100-mile races well into their 60's. Nine months following his arrival, McDougall was "transformed after getting rid of his cushioned shoes and adopting the Tarahumaras' whisper-soft stride." He was eventually able to join them for 50-mile runs through the canyons, and says he has not lost a day of running to injury in the 7 years since.

The Tarahumara, who are also called Raramuri, have lived in Mexico for the past several thousand years. Roughly translated, Raramuri means “foot runners,” or “those who run fast.” There are nearly 100,000 Tarahumara who still inhabit northwest Mexico in the Copper Canyon range of the Sierra Madre Mountains. Located in the state of Chihuahua, Copper Canyon is one of a dozen massive canyons, several deeper than the Grand Canyon. The Tarahumara first retreated from “civilization” and the invading Spaniards more than 500 years ago, and then retreated even further, from those seeking gold in the Mexican hills, to their current Copper Canyon locale.

Living in high altitudes, out of sight, the Tarahumara dwell in natural shelters--caves and cliff overhangs, or simple huts. Today they are known principally for their long-distance running, and simple lifestyle apart from the modern world. Their running skill is one of endurance, rather than speed, and has been traced to their survival (running from their enemies) and to their culture. They have always lived in widely disbursed settlements in mountainous

areas, conditions which make communication and travel possible only by foot. Long distance running has been their mail delivery, means of transportation and communication, sport, and method of hunting.

The Tarahumara are reported to have run nonstop for a distance roughly the equivalent of New York City to Detroit, nearly 435 miles! They are not wearing running or cushioned shoes; instead, they run barefoot or in huarache sandals, which are homemade, oftentimes from discarded tires, held together and laced up by leather straps. Their footwear evokes images of a Greco-Roman sandal--- think Phidippides. Their running method is also unique, one in which for each stride the toe or forefoot lands first, rather than as in today's conventional athletic running shoe style, which is heel strike first.

Tarahumara males wear loincloths, sandals, and billowy long-sleeved blouses, and a cloth headband. Their long, loose, full-sleeved shirts are made of cotton, while their loincloth is held together by a wool girdle wrapped around the waist. Women wear

distinctive layered, colorful skirts, as well as blouses, which are worn loose at the waist. The blouses have full sleeves and the women also wear cloth headbands.

Running is the Tarahumara principal means of athletic expression. The men race in staggeringly long trail runs, wearing their huarches or going barefoot, while steadily kicking a baseball size wooden sphere in what are called "foot-throwing" competitions. The wooden balls are dribbled (as in soccer) along the mountain ranges from runner to runner. When the women run, they fling and catch hoops with long sticks as they go. Most of these competitions are relay races and have been known to last anywhere from a few hours to several days.

The Tarahumara are also noteworthy for their health and dietary customs. They eat primarily fruits, vegetables, and whole grains, together with beans and squash, by choice and practicality given the extremes of the terrain and climate in which they live. Always part of any meal is pinole, a powder of toasted corn mixed with water, as well as an alcoholic beverage brewed from corn.

They supplement their diets with chia seeds, served in an almost gruel-like state. Chia has been found to be rich in antioxidants, omega 3, and other ingredients for which today we pay millions of dollars annually, as supplements and enhancements to our own diets. I'm not sure why Christopher Katt rebuffed all of my entreaties to serve a traditional Tarahumara meal, complete with pinole and chia seeds, this evening!

Diet most certainly plays a role in the Tarahumara's health. Of the top 10 health risks facing American men, the Tarahumara have been found to be practically immune: their incidence rate is at or near zero in every category, including diabetes, vascular disease, and colorectal cancer. So, while we, one of the most technologically advanced nations on earth, keep getting fatter, sicker, and sadder, the Tarahumara, who haven't changed a thing in nearly 2,000 years, survive and seem to thrive. What have they remembered that we have forgotten?

Back in the '60s, Americans ran more and ran faster while wearing the thinnest little shoes, and did so without getting hurt.

After graduating from the University of Oregon in 1959, Phil Knight received his MBA in finance from Stanford University. There Knight wrote a paper proposing that quality running shoes could be manufactured in Japan that would compete with the more established German brands of the time.

Together with Bill Bowerman, a track coach turned entrepreneur, in 1965 Knight started a fledgling company called "Blue Ribbon Sports." A few years later, they opened a retail store in Santa Monica, California. Blue Ribbon Sports pioneered cushioned running shoes which had an outsole with waffle-type nubs for traction, but which were lighter than traditional training shoes. In 1971, Blue Ribbon Sports changed its name, came up with the "swoosh," Steve Prefontaine began wearing their shoes in international competition, and the rest truly is history. Nike was born!

Beginning in the 1980's, running magazines, including principally *Runner's World*, began testing and rating running shoes. The tests evolved from first rating running shoes as

"performance accessories" to rebranding shoes as "safety items," much like smoke alarms or bike helmets. The message was clear: without the "right" shoes you could get hurt, perhaps suffering long term injuries. Since then, and to this day, *Runner's World* tells beginning runners that their "first steps" should be to a specialty running store to get fitted with the proper shoes that will have you running pain-and injury-free.

Athletic and running shoes are today a $20 billion dollar, international industry. "Barefoot-style" shoes, which include the Vibram FiveFingers, a rubber foot glove with no heel cushion or arch support, comprise nearly $1.7 billion of that industry. No wonder there exist philosophical, ideological and economic clashes between the shod and unshod running communities.

One way to know what shoes have done to runners is to go back to the future, to a time when none existed and no one wore them. In part, this is what McDougall discovered when he lived among the Tarahumara, and is what scientists and anthropologists have seemingly known for years from their study of human

evolution. Persistence hunting has long been viewed as man's initial means of subsistence. Humans in excellent physical condition, given the time, can outrun quadrupeds, which slow down over long distances, losing their ability to pant. As a result, quadrupeds overheat from galloping, while during the same period of running, humans naturally cool by sweating. Eventually, this disparity among the HVAC systems allowed humans to overtake and kill their prey.

The prevailing evolutionary theory is that endurance running allowed primitive humans to incorporate meat into their diet. A recent anthropological study documents that persistence hunting still exists today among modern hunter-gatherers, like the Bushmen in Africa. Similarly, other studies within the past 5 years offer even more evidence that evolution favored and fostered endurance running by humans, including studies that center upon our relative ease to run because of:

> (1) the short toes of the human foot v. longer-toed animals; (2) the straighter big toe in humans, aligned

> with other toes; (3) the spring like ligaments and tendons in our feet and legs; (4) our narrow waist that allows for turns and swinging of our arms; (5) our ability to store about 20 miles' of glycogen in our muscles; and, (6) the gluteus maximus, the largest muscle in the human body which is primarily engaged only while running.

We were, as McDougall's book proclaims: "born to run," a truth that has led scientists like Daniel E. Lieberman, a professor of human evolutionary biology at Harvard, to study nearly 2 million years of human endurance running. This in turn has led to an assessment of how humans ran comfortably and safely, and coped with the impact caused by the foot colliding with the ground (i.e., foot strikes), before the introduction of the modern day running shoe.

Together with other scientists in the United States and all over the world, Dr. Lieberman has been investigating the biomechanics of endurance running. These studies compare habitually barefoot runners with runners who normally run in

today's running shoes, shoes marked by their built-up heels, stiff soles and arch support. Lieberman has found that while most runners in shoes come down hard on their heels, barefoot runners land with almost zero initial impact shock. People who run barefoot tend to land with a springy step towards the middle or front of the foot. By comparison, heel-strikers collide with the ground with a force equal to as much as three times their body weight and do so about 1,000 times per mile run!

Himself a six-time marathoner, Lieberman has begun to run barefoot based upon the results of his research. So too has the previously mentioned Dr. Irene Davis, now the Director of Harvard Medical School's Spaulding National Running Center. A retired runner due to injuries, today she runs 20 miles a week and is injury free since she began her barefoot career. No longer does Dr. Davis prescribe orthotics to her patients.

But, simply changing your footwear will not make you a world class runner or someone who can run like or with the Tarahumara. It's not just what you put (or don't put) on your feet;

it's also about how you run, your form. To run like the Tarahumara, one needs to unlearn the heel strike and relearn pre-running shoe biomechanics.

To do that, we again go "back to the future," this time to the turn of the last century, and the teachings of W.G. George, the fastest miler of his time. He invented an exercise in 1874 to perfect his running form when he was a 16-year old apprentice chemist in England, with limited time to train. In 1908, he wrote an essay entitled *"W.G. George's Own Account from the 100-Up Exercise."* I'm confident that his "essay" was not delivered to or heeded by the London Kit Kat Club members.

The 100-Up exercise is divided into two grades- the Minor and the Major. First, draw 2 parallel lines along the ground, 18 inches long and 8 inches apart as targets for landings. Place one foot on the middle of each line, arms at your side. For the Minor, "raise one knee to the height of the hip, and bring the foot back down again to its original position, touching the line lightly with the ball of the foot, and repeat with the other leg. Continue raising

and lowering the legs alternately" George wrote. He went on to say that "[t]he exercise at first sight looks so easy of accomplishment that one might well think it possible to go a thousand up." But, he added, "This would be the result of not raising the knees to the prescribed height- which is the main point of the exercise."

For the Major, stand on the lines as before, except "the body must be balanced on the ball of the foot, the heel clear of the ground, the head and the body tilted very slightly forward, and the hands by the side….spring from the toe, bringing the knee to the level of the hip. Repeat with the other leg….alternately. This action is exactly that of running…except the foot drops back into its original position on the ground."

In closing his now 104 year old essay, George admonishes, while at the same time exhorting the reader:

> The student must not expect to get true action in a moment. The first few attempts may even be

> disappointing, but keep steadily trying, and the correct form will come sure enough.
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> Success is the result of the application of scientific methods of training to the development of natural talents or skill, which we all possess in some degree or other. In placing the '100-Up' exercise before the public, and thus spreading out knowledge of it still further I am confident I am giving them an exercise which though simple and natural in practice and incapable of harm when practiced discreetly, is second to none as a means of attaining, and retaining, physical fitness, and of developing body muscles and health generally.

After 2 years of following his '100-Up' regimen, George became the fastest amateur miler in England. After 5 years, he held world records in all distances from the half-mile to ten (10) miles. Through refinement of the '100-Up,' which in essence was a running form, exercise and style first utilized nearly a million years earlier by humans without running shoes, George transformed himself into the most celebrated racer of his day.

The legendary exploits of Phidippides, and extraordinary feats of the Tarahumara, W.G. George and countless others should come as no real surprise. Humans have always been the greatest endurance runners on earth. Dr. Lieberman notes: "Although humans no longer need to run, the capacity and proclivity to run marathons is the modern manifestation of a uniquely human trait that helps make humans the way we are." And there is no easier way to run injury free than to go "back to the future" and run barefooted.

We should also heed and never forget the very real and practical advice of yet another noted "doctor," "author" and "evolutionist"--- named Seuss-- who quite correctly said:

> "Step with care and great tact, and remember that life's a great balancing act.
> Just never forget to be dexterous and deft, and never mix up your right foot with your left."

~Dr. Seuss, *Oh the Places You'll Go*~