Age of the Runner

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That was before age-group running. Only when runners began to compare themselves with other runners of the same age did the competitive sport spread out from its previous limits. And how it has spread!

Age of the Runner tells how the sport has grown younger and older, pointing out that:

1. The physical changes of aging—the rapid speeding up early and the gradual slowing down later on—are inevitable.

2. Runners have a way of growing old more gracefully than less active people.

The book examines the effects of age on performance, and of running on aging. A special feature is the charts for comparing racing times, age for age. They give a new perspective on the relative value of marks, and can make every year a good one. Included are 19 of Ken Young's Age-Graded Scoring Tables—for events 800 meters through 50 kilometers, ages 10-80.

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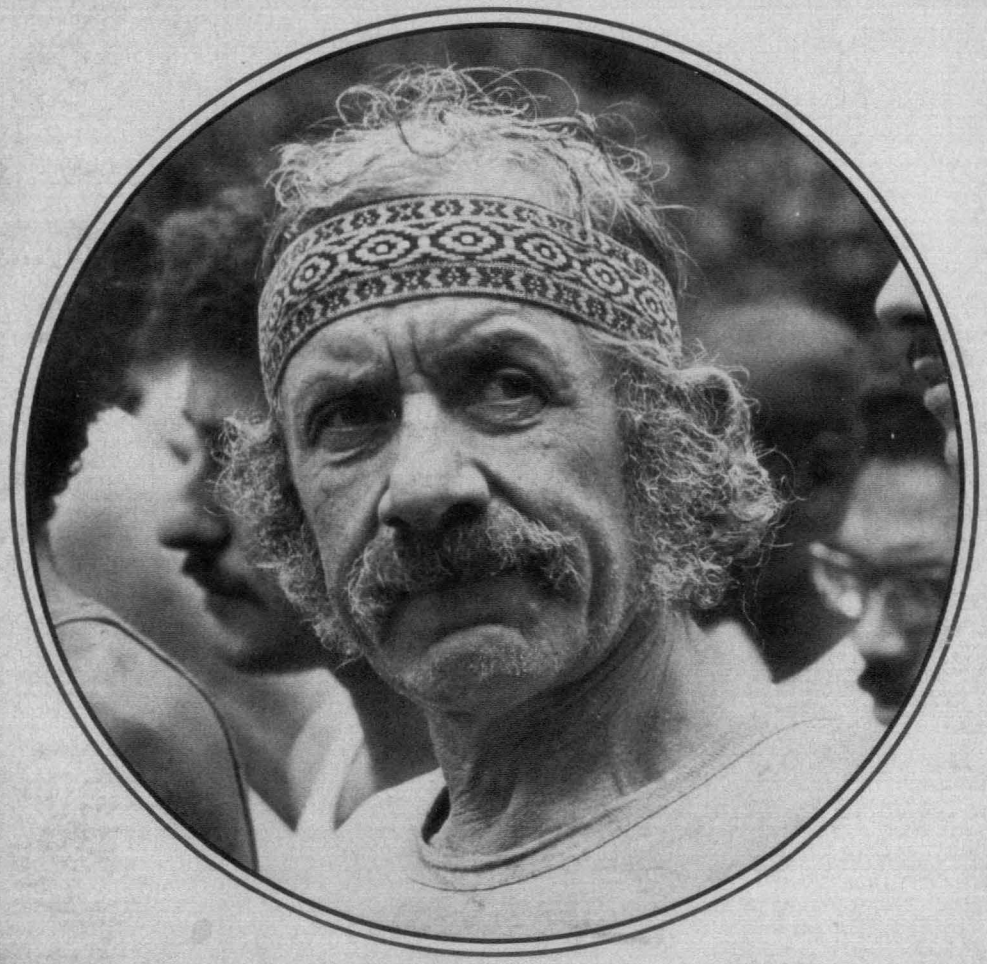
Age of the Runner



Anticipating the good times in youth;

holding onto the good things with age.

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Age of the Runner

Cover photo of Irving Taylor, by Steve Sutton

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The Mir explains, "Cheerfulness is the best mental tonic. If you enjoy your work, you will do it in a relaxed manner, while hate and grumbling will create tension and the nerves will become jumpy.

"Here in Hunza, each task is done with love. A man is lucky to have a field to work. He is lucky to be able to feel the warm sun and know that his muscles move in rhythm with his work. He is lucky to be able to see the beauty which lies all around him."

All Hunzakuts are endurance athletes who practice all day. They have to work the fields and move long distances on foot. Otherwise, they have no food and no contact with the outside world.

Every other day, a runner travels over the high mountain pass from Hunza to Gilgit. He picks up the mail and runs back. The round trip is 200 kilometers, about 120 miles. Other Hunzakuts frequently walk the distance, preferring walking to riding a horse.

The Hunza people have dug such a well of endurance that they have plenty of energy left for playing after they're through working. Renee Taylor watched a volleyball game while in Hunza. It matched the young men of the valley against older ones. The youngsters were ages 15-50. The veterans were all over 70. One man was 125.

Taylor writes, "Both teams played a strenuous game in the scorching heat of the afternoon sun. If any player was fatigued at any time during the game, it was not discernible. They all seemed as relaxed and comfortable as though they were playing a friendly game of canasta."

The younger men won, but only by a couple of points. It could have gone either way, and age was not the deciding factor. The writer was amazed at the ability of the older men, and said so to the Mir.

The Mir replied, "When will you people learn that our men of 100 feel no more fatigued than our men of 20? Be careful what you say, or soon you will have our people of over 100 feeling three times their age. And then they will think they are growing old."

Age is not a death warrant. It's an opportunity to grow, to keep moving, to keep enjoying nature and people.

Shirali Mislimov was the world's oldest man when he died at 168. The Soviet citizen had said, "There are two sources of long life. One is a gift of nature, and it is the pure air and clean water of the mountains, the fruit of the earth, peace, rest, the soft and warm climate of the highlands.

"The second source is people. He live longs who enjoys life and who bears no jealousy of others, whose heart harbors no malice or anger, who sings a lot and cries a little, who rises and retires with the sun, who likes to work and knows how to rest."

Larry Lewis of San Francisco ran and worked until a few months before his death at 106. He always hated the word "old."

"Never say a person is so many years *old*," Lewis once snapped at a reporter. "Old means dilapidated and something you eventually get rid of, like an old automobile or refrigerator. You're like a violin, a portrait, a wine. You mellow, but you never grow old."

FOREWORD

Age. It rarely seems to be in the right amount or move at the right pace to suit us.

People spend their first 20 years trying to speed it up, and the next two score and 10 years trying to hold back its march. We can't change our age either way, of course, but that doesn't stop us from trying to grow up faster and grow old slower.

The years from the mid-teens to the mid-20s are the peak ones for the kinds of abilities running requires. This isn't much time, and it comes early on the scale of a lifetime.

For a long time, the only people who ran were close, one way or other, to age 20. The ones very much younger or older than that couldn't keep up, so they seldom tried. They planned or remembered, or they didn't consider running at all.

That was before age-group running. There was never any physical reason why a boy or girl couldn't start running early and continue indefinitely. But social restraints partly kept them from it. And personal reluctance did the rest. Running times are so easily measured that differences are too obvious and intimidating. No one wants to look bad, particularly for a reason they can't help—like age.

Only when runners could begin to compare themselves with other runners of the same age did the competitive sport spread outside its previous narrow 15-25 limits. And how it did spread! By the early 1970s, there were national championships for children as young as five and men in their 70s. Age-group record books listed marks for one-year-olds. Long distance races mixed all ages together for running but separated them at the awards ceremony.

It wasn't and still isn't necessary (perhaps not even wise) for runners at the extreme ages to have championship ideas. But they have shown thousands of other runners like them that running is possible and is healthy at any age. No one has to talk of it in the future or past tense any more. They can have it now, and every year can be "now."

There are two messages in *Age of the Runner:*

1. The physical changes of aging—the rapid speeding up early and the gradual slowing down later on—are inevitable.

2. Runners have a way of growing old more gracefully than less active people.

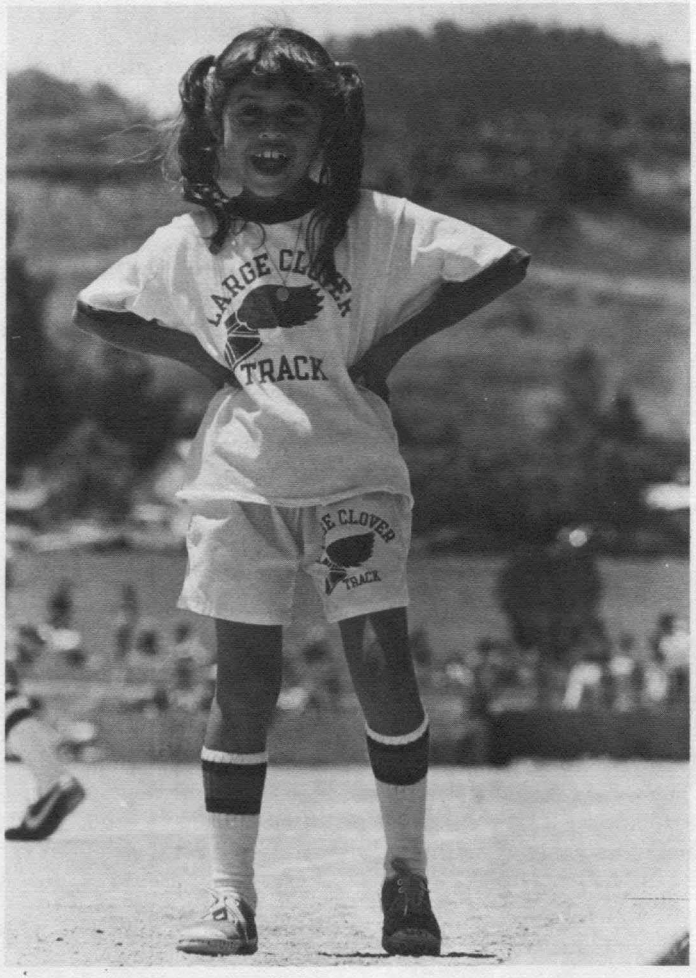
The book examines the effects of age on performance, and of running on aging. An added feature is the charts for comparing racing times, age for age. They give a new perspective on the relative value of marks.

The value of running itself is ageless, runners in general are only now coming to know. It is, in the words of Fritz Schreiber, a runner for 70 of his 80 years, "A melody of my life, of all my life: to sweat out anger, to concentrate on the tasks of life, to feel the pleasure and delight of loneliness and freedom, to be all of a human being."

This kind of value isn't measured on a stopwatch, or on a calendar.

1

Through the Ages



John Marconi photo

enough of what it needs because the people don't ask for much, and because no one else wants it badly enough to fight for it.

The people there live long, happy, productive lives partly because they don't concern themselves much with time and age. This frees them from the hurry and worry that comes with alternately trying to rush time and hold it back—both most fruitless and frustrating exercises. The people of Hunza have a grace that comes from flowing with time rather than trying to control it.

Renee Taylor writes, "Time is not measured by clocks or calendars (in Hunza). Time is judged by the changing of the seasons, and each season brings the feeling of newness, not a fear that time is slipping irrevocably away.

"In the west, on the other hand, where lives are dominated by clocks and calendars, we tend to view each passing moment as a little piece of life which has cruelly slipped away from us, never to return. Each such slipping bit of time brings us closer to old age, and ultimately to death. We worry so much about growing old that we actually increase the process."

In Hunza, a man's life divides into three periods, the Mir says: "The young years, the middle years, and the *rich* years. In the young years, there is pleasure and excitement and the yearning for knowledge. In the middle years, there is the development of poise and appreciation, along with the pleasures, the excitement and the yearnings of the young years. In the rich years—by far the best period of all—there is mellowness, understanding, the ability to judge and the great gift of tolerance—all of this combined with the qualities of the two previous periods.

"The keynote of life is growth, not aging. Life does not grow old. The life that flows through us at 80 is the same that energized us in infancy. It does not get old or weak. So-called age is the deterioration of enthusiasm, faith to live and the will to progress."

The Mir adds, "Here, there is time to think only of the necessary things. To worry over such an intangible thing as the ticking of a clock or the turning of a page on a calendar, this is foolishness."

There is no such thing as retirement in Hunza. A Hunzakut works all his life, because if he doesn't he doesn't eat. But far from being necessary drudgery, it is a joy for the Hunzakut to work. Nearly all of them are farmers. They spend long days scraping small amounts of food from the rocky slopes. They're up before dawn, and don't come home from the fields until the sun is setting, stopping only twice during the day.

The people of Hunza can work this way—often for a hundred years straight—because of the way they look at and pace their work. Renee Taylor says, "Perhaps aside from the magnificent nutrition of the Hunzakuts, their mental attitude (is) the key to their extraordinary longevity."

They believe that without work, a man is as good as dead. "From the day a Hunzakut is born," the Mir says, "he is never coddled. He keeps active until the day he dies... The idleness of retirement is a much greater enemy to life than work. Our people continue to work by choice."

Renee Taylor observes that "the ability to relax is at the bottom of everything. Watch the Hunza people at work or at rest. They are completely relaxed, completely at ease." This is because they don't fight their work. They enjoy it.

The kingdom of Hunza, almost two miles high in the Himalayas, has no jails because there is no crime, no hospitals because there is no sickness, no banks because all trading is done by barter among neighbors. Men and women work the fields until well past the age of 100.

This is a land of walkers and runners. Anyone from here can cross on foot the single high mountain pass that connects Hunza with the nearest modern settlement, 100 kilometers away. Over and back is a day's journey.

Officially, Hunza belongs to Pakistan. But the ties are loose. The land of Hunza is self-contained both physically and emotionally. The people have a separate Hunzakut way of life. Unlike their ever-bickering neighbors on the other side of the mountains, the Hunzakuts haven't been at war in 150 years. Life expectancy in India and Pakistan is among the shortest in the world. In Hunza, men claim to father children after 100.

The Hunza diet doesn't have much more to it than coarse, stone-ground wheat flour and apricots. These two foods are the staples, everything else is a luxury item. The people can't go to grocery stores because there aren't any. Everything they eat, they grow for themselves.

Growing food eats up most of the Hunzakuts' time, and there isn't much left over to spend on cooking. So nearly everything is eaten raw or slightly warmed. Not much preparing is done. The Hunzakuts do cook their meat. But they only eat meat two or three times a year, at special ceremonies.

Dr. Robert McGarrison, an English surgeon, spent seven years in Hunza in the 1920s, and had almost no medical work to do with these people. Apparently, not much has changed there since then. McGarrison experimented with diet, using albino rats as subjects because they eat all human food and their short life-span let him study them from birth to death. One "population" of rats ate a Hunza-style diet, another ate the typical food of India, and the third ate like working-class Englishmen. All rats had identical living conditions.

The "Indian" rats developed "eye ailments, ulcers, boils, bad teeth, crooked spines, loss of hair, anemia , skin disorders, heart, kidney and glandular weaknesses, and a multitude of gastrointestinal disorders."

The "English" rats "were nervous and apt to bite their attendants. They lived unhappily together, and by the 16th day of the experiment they began to kill and eat the weaker ones amongst them."

The "Hunza" rats: "During the past 2½ years (equivalent to 50 years in man), there has been no case of illness in this universe of albino rats, no death from natural causes in the adult stock, and but for a few accidental deaths, no infant mortality... This stock has been shown to be remarkably free from disease."

The Hunza diet seemed to prevent disease. But what about curing the ill and infirm? Dr. McGarrison tested that, too. He took diseased rats from the diet-deficient populations and switched them to Hunza-style feeding. They all got well.

"We are the happiest people in the world," the Mir (King) of Hunza told Renee Taylor for the book *Hunza Health Secrets.* "We have just enough of everything but not enough to make anyone else want to take it away. You might call this 'the happy land of just enough.' " Hunza is a land that has

THE AGELESS RUNNER

BY GEORGE SHEEHAN, M.D.

One of the beautiful things about running is that age has no penalties. The runner lives in an eternal present. The passage of time does not alter his daily self-discovery, his struggles and his sufferings, his pains and his pleasures. The decline of his ability does not interfere with the constant interchange between him, his solitude, and the world and everyone around him. And neither of these happenings prevents him from challenging himself to the ultimate limit, putting himself in jeopardy, courting crisis, risking catastrophe.

Because he refuses to look back, the runner remains ageless. That is his secret, that and the fact that his pursuit of running is in obedience to, in Ellen Glasgow's phrase, "a permanent and self-renewing inner compulsion."

At 55, I am aware of all this. Like all runners, I live in the present. I am not interested in the way we were. The past is already incorporated in me. There is no use returning to it. I live for the day. Running gives me self-expression, a way of finding out who I am and who I will be. It makes me intimate with pain. I know the feeling of too little oxygen, of too much lactic acid. I have, always within reach, the opportunity to test my absolute barriers, to search out the borders set up by straining muscles and a failing brain.

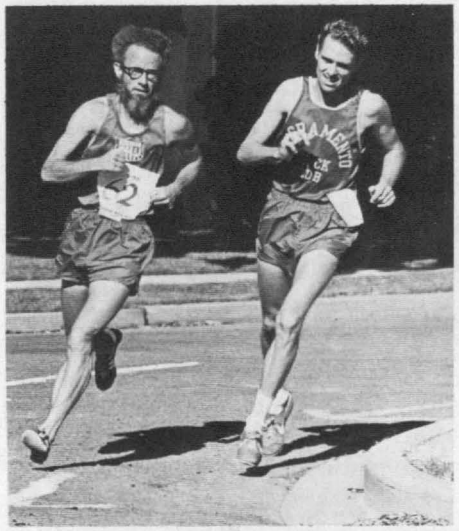
But what about performance and competition? What about time and place? How does the aging runner handle the stopwatch? How can he feel really competitive during a race? The answers are (1) age-rated performances, and (2) age-group races.

For less than the entry fee to the Boston marathon, you can get a computer printout of your age-rated performances for every standard running distance (see Chapter Three). With this point scoring, you can compare your results not only with your own achievements from year to year but with world class (1000 points), or national championship (900), or high school dual meet (600-700) performances.

Age-group racing normally begins at age 40 for older runners (there's a similar program for the very young), with classes split down to five-year increments.

Together, they make age 55 as exciting as 21. They make every race important, and therefore stimulating and absorbing and exhilarating just like the ones I ran one recent weekend.

The first was the 40-and-over mile. Normally, I would be over my head in a 40-and-over race. Some of these runners arrive at the line with the icing of their 40th birthday cake still on the corners of their mouth. But this



Ross Smith (left), national AAU 50-mile champion at age 45, competes on even terms with runners two decades younger. Beside him here is Frank Krebs. (Om photo)

time only one really good runner, Joe Bessel, showed up. Bessel won by a hundred yards to polite applause. But the crowd was on its feet and shouting for three of us fighting it out down that last furlong, the longest homestretch I have ever seen.

I just outlasted the other two in 5:19 (840 points) and afterward received my plaque from Ben Jipcho (an 1100-point miler). Now you can say what you will, but there are not too many ways a 55-year-old can equal taking a second place, running the equivalent of a 4:17 mile and getting his prize from one of the world's best milers—especially when Ben Jipcho says "Fantastic..." in handing it to you.

The weekend, however, was not over. A five-mile race with 300 entries was the next day. Here, I moved back into the 50-and-over category and my initial appraisal at the starting line disclosed there was no one to worry about. I could concentrate on my form, my time and my point score. Winning the 50-and-over would take care of itself.

So I was in a state of happy agony nearing the finish, knowing I was the winner in my division, when I saw Rod Nichols up ahead. I had always thought of Rod as a very good runner working out his salvation in the 40-and-over group. But I suddenly noticed that Rod was getting quite bald, and it occurred to me that Rod had been around the running scene for a very long time. He began to look more and more like a very competent 50-year-old.

At considerable cost, partially paid for by the panic I felt at this thought, I caught up to him. Easing alongside, I casually gasped, "How old are you, Rod?"

"I'm 75," he replied in a tone just short of exasperation, and then added, "I'm 44."

I relaxed. I didn't have to beat him. When he gets to be 50, I thought as I cruised around the high school track to the finish, I'll be in the 60-and over.

A LONGEVITY FORMULA

Living a long time involves more than having the right set of parents and staying clear of accidents. Those are matters of chance. There are matters of choice, too—ways of juggling one's lifestyle to promote longevity.

Dr. Alexander Leaf, professor at the Harvard Medical School, has hunted out the world's longest-living populations and tried to figure out why they are so durable. He looked at groups, not individual exceptions to a society's norms.

To find these groups, Dr. Leaf traveled to three remote areas—the Hunza region in Pakistan, Vilcabamba in Ecuador and Abkhazia in the USSR—where men and women routinely see their 100th birthdays and are alive enough to enjoy them.

Leaf wrote in *National Geographic* that the three widely separated groups have several things in common:

1. They live in the mountains, usually at high elevations.
2. The mountainous terrain has cut them off somewhat from the mainstream of modern life.
3. They give high status to the aged, who retain a full role in the community.
4. They eat lightly, and the diets include little or no meat.
5. Their everyday living demands almost constant endurance activity.

The physical capacities of these groups most impressed Dr. Leaf. He writes, "The old people of all three cultures share a great deal of physical activity. The traditional farming and household practices demand heavy work, and male and female are involved from early childhood to terminal days.

"Superimposed on the usual labor involved in farming is the mountainous terrain. Simply traversing the hills on foot during the day's activities sustains a high degree of cardiovascular fitness as well as general muscular tone."

Shamed by not being able to keep up with a 106-year-old on a six-hour mountainous hike, the doctor began running when he returned to the United States. He wasn't a mountain farmer, and figured this was the next best exercise for him at age 52.

Even before Dr. Leaf's article in *National Geographic*, much had been written about the people of Hunza. As much of it is fiction as fact, perhaps, but enough is known about the Hunzakuts to say that they are among the fittest residents of this planet.

At 15-year intervals, Hollman tested middle-aged persons. (They were all past 40 at the time of the first check, and in their late 50s at the second.) He divided them into groups: active in sports and inactive. The non-athletes gained an average of 20 pounds and lost 30% of their oxygen consumption capacity. The athletes gained only half as much weight and had less than a third the decline in maximum oxygen intake.

Hollman doesn't mention what kind of exercise the men took, or in what amounts. If it had been running in doses of several miles a day, the results might have been even more convincing. Running is known to have a major influence in weight control and oxygen usage.

Keeping the weight low and the heart-lung system in tune may be insurance against heart disease, the major killer of modern man. Dr. Sheehan hints in the preceding article that ectomorphs (lean people) are less prone to heart disease than heavier ones, and that running is an ectomorphic sport.

Dr. Thomas Bassler, the Southern California physician who contends that running about an hour a day and competing in marathons gives almost absolute heart protection, comments:

"Dr. Sheehan's somatotype logic certainly hits the point... but no one will see it. They will say, 'It is genetic, and you can't do anything about it.' However, current efforts to make marathoners out of the most unfit post-heart attack patients will change all that.

"From now on, the marathoning oldster will become a new statistical group—the 'acquired ectomorph' who drops his body weight 30-50 pounds. I am sure the new ectomorphs will share the longevity of the so-called natural ones. They look like ectomorphs, they run like them, and in the lab they test out like them."

Acquired with the endomorphic body is the endomorph's tendency to endure.

LONG-TERM EFFECTS

BY KAJ JOHANSEN, M.D.

Dr. Johansen, a medical researcher living in San Diego, is an ex-oarsman who now runs long distances. He has been within seconds of a 2:30 marathon, though at 6'5" and 185 pounds he hardly has typical marathoner dimensions. His article first appeared in the San Diego Track Club Newsletter, which he edits.

The ancient fathers of medicine, Hippocrates and Galen, felt that sports competition and the training involved brought on an early death. Several studies of competitive oarsmen appeared to demonstrate during the 19th century that participants in this most grueling of all athletic activities died before their sedentary brethren. Several decades ago, a study by Paul Dudley White showed that a high percentage of heart attack patients had participated in high school and college athletics. And it is axiomatic that people with the "athletic" body build—the so-called "mesomorphic" build with thick muscles, wide shoulders, narrow waist and hips—tend to have a far higher incidence of coronary artery disease (that is, leading to heart attacks).

In the last 15 years, phenomenal change has come in the way athletes, both young and old, train for their competitive activities. Dr. Roger Bannister, the first man to break the four-minute barrier in the mile, was one of the last world class athletes to restrict his training to an avocational, recreational schedule. Since his time (the mid-50s), there has been a steady acceleration in time and energy spent, and pain and suffering endured. *Medical World News* comments, "Physical punishment is the overriding theme."

Indiana's famed swim coach, "Doc" Counsilman, is quoted as saying, "To convert a merely good swimmer into a champion, you must expose him to what he thinks is the ultimate, agonizing limit of physical performance and then teach him to go beyond that limit."

The critical point is that such "PTA" (pain, torture, agony) regimens are being used by younger and younger children (some organized swimming and running programs start as early as five years of age) and extend to older and older veterans.

Though actual improved health or longevity has not been rigorously proven in association with long-term vigorous physical exercise, most current evidence implies these conclusions, and the "non-scientific" improvement in people's moods and attitudes when they are in shape is undeniable.

Dr. Tom Bassler believes that being in good enough shape to complete a

sub-four-hour marathon provides guaranteed protection from heart attack for several years.

A recent study comparing Harvard and Yale oarsmen and their sedentary classmates indicated that the former athletes lived more than six years longer, on the average, than their inactive peers.

Studies of long distance runners (including the famous Tarahumara Indians of Mexico, who engage in marathon races of up to 150 miles at 7000-8000-foot altitudes from early childhood) indicate a markedly lower incidence of high blood pressure, now recognized as a major cause of heart failure and blood vessel disease.

The usual flabby, dilated heart that occurs in the older sedentary people can be returned toward normal by exercise. Dr. Thomas Cureton of the University of Illinois reduced the heart size of three sedentary businessmen by 8 to 21.6% with a course of training.

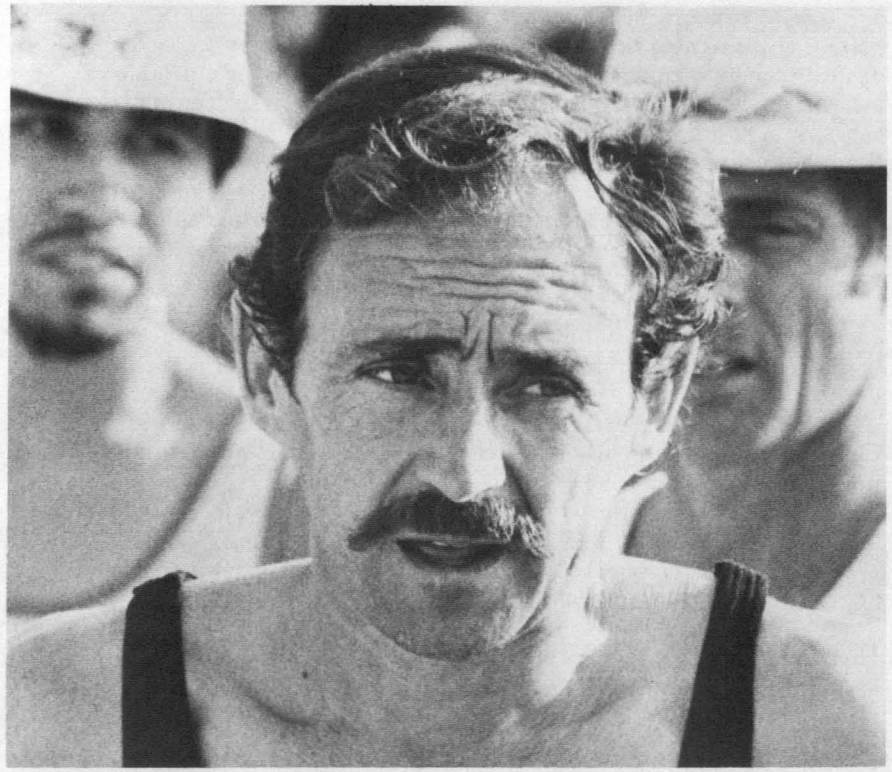
Most experts in the field feel that aging is retarded by chronic physical exercise. Says Dr. Allen Ryan, former president of the American College of Sports Medicine, "I personally believe that a former athlete retains an edge over the person who has never exercised. Most professionals working in the field think so, too, but it's virtually impossible to prove. We know that an inactive, sedentary life has a negative effect on the preservation of a normal, healthy circulation. All other factors being equal, the cardiovascular deterioration that occurs in everyone reaches a lower point in the person who has never exercised than in one who has. The former athlete starts down from a higher base level."

Other than the usual aches and pains that occur with exercise, what are some of the problems that physicians and exercise physiologists are concerned about when they question the long-term effects of exercise on the young and old? One that is probably *not* a problem is the so-called "athletes heart," a term describing the enlargement of the heart that endurance athletes get. It is caused by both dilation of the heart chambers and thickening of the walls of the heart, allowing larger amounts of blood to be pumped more forcefully (therefore fewer times per minute, leading to increased efficiency). "It shouldn't be considered pathologic," says Dr. Ryan.

The so-called "athlete's kidney" is also a rarity. It is the unusual structural deformity of the kidney that is seen very infrequently in endurance athletes. It should not be confused with the frequent occurrence of small amounts of blood or protein in the urine after vigorous exercise, which is probably trivial.

Dr. Counsilman has not been able to discover any sign of lung, heart, muscle or glandular injury in his vigorously-driven athletes, but does note that stress-related ills—the common cold, strep throat, mononucleosis, some allergies—do increase during competitive periods. It has been suggested,

RIGHT: Monty Montgomery, the phenomenal southern California marathoner who ran 2:53 at age 65. (Doug Schwab photo)



New Zealander Jack Foster is the most amazing veteran runner yet. He raced a marathon in 2:11 at age 41. (M. Julius Baum)

Drs. Michael Pollock and Henry Miller have tested a number of champion athletes in the 40-and-over age group. "It was particularly interesting," the doctors write, "to note the high maximum oxygen intake results." These runners used oxygen as effectively as people less than half their age.

"Resting heart rate, body fat and serum triglycerides (fat in the blood fluids) were much lower in the tested runners than in the sedentary population, while blood pressure and serum cholesterol were approximately the same. The latter agrees with other research findings in that serum cholesterol appears to be affected more by diet than by exercise per se, and normal resting blood pressure values are not usually affected by exercise."

Resting heart rates were 10-20 beats per minute lower than average for men their age. Body fat was about half of normal. A point to make here is that these athletes probably would have been "average" or "normal" (i.e., unfit) if they hadn't stayed active. Many were just that when they started running.

Even with continuing exercise, physical capacity drops through the years, Pollock and Miller say. But the declining is apparently slower with exercises than non-exercisers. Dr. Wildor Hollmann of Germany has figures to back this claim.

THE 70-YEAR WARRANTY

"We are born," Dr. George Sheehan points out, "with a 70-year warranty. But we never bother to read the instructions. Three score and 10 the Bible promises us. But the average American newborn will never see it."

An American male is beating the national odds if he lives to see his 70th birthday. His average lifespan is now 67.1 years, well behind US women and well down the list of the world's leaders. American women now live 74.6 years and rank ninth in the world in longevity. American males are way down in 24th place.

But even the countries up ahead have no cause to gloat. In only four of them—Sweden, Norway, Denmark and the Netherlands—do men typically live out their allotted three score and 10. Even with the best medical care in history, men die too early.

What's wrong? We aren't reading the instructions that come with the warranty. Dr. Sheehan writes, "The instructions when we left Eden were simple enough: a six-day work week, and work that would bring sweat to our brow."

The hard work isn't required of most people any more. But Sheehan says, "The sweat of our brow, no longer necessary to earn our daily bread, has become even more necessary to make us fully functioning men and women. It now determines whether or not we will live a full 70 years and live them at our full physical potential.

"Man does not have a built-in obsolescence. He is not made to break down, rust out or come apart at an early age."

Men break down because of owner abuse and neglect, which the usual warranty doesn't cover. Upkeep is the owner's responsibility. That involves a minimum amount of regular use and the right kind of fuel.

Most people don't get the exercise. Harvard nutritionist Dr. Jean Mayer calls Americans "the most immobile group of men in the history of the world."

We get too much of the fuel, and the wrong grades. Dr. Sheehan says, "Too little exercise plus too much saturated fats, sugar and salt... cancel out the warranty." The result is an epidemic of early rusting out and coming apart.

Can anything be done about it? Of course. Go back to the original instructions, work up a daily sweat, eat lightly and naturally, and the breakdown can be stalled. The destruction starts from the inside—with the heart and lungs that grow flabby, with blood vessels that get clogged, with blankets of fat under the skin.

An exercise like distance running, combined with a sensible low-calorie, low-fat diet, can work the cardiovascular system, flush out the plumbing and eat away the fat. Running literally can keep a body young.

though not demonstrated, that early vigorous training in girls may cause some menstrual irregularities, leading Dr. Counsilman to suggest diminishing the intensity of training during such times.

One of the major points of concern about training in the young stems from the demonstration of some growth retardation in young rats forced to swim strenuously, as well as diminished kidney development. The experimental results are not to be transferred to children, but do imply the necessity for human studies.

Finally, perhaps most importantly, the careful balance between undeniable psychological benefits of exercise and competition on the one hand and the destruction of the young child's personality because of parental ambition (the "Little League Parent" syndrome) must be respected. Says Dr. Ryan, "starting formalized training too early can result in the youngster being turned off to physical exercise, giving it up and never going back to it. To me, the age to start intensive athletic training, if a child is interested, is about 12 or 13 years. On the other hand, if you want to develop a Mark Spitz, you better start at age six."

Science, as usual, hasn't kept up with the activities and accomplishments that people have taken for granted. Dr. Ryan notes, "There's not a single bit of scientific evidence that what's going on at the present time in athletics is harmless, let alone good for people."

Nevertheless, for both young children and old folks, the benefits of vigorous physical exertion are so self-evident that for those people no dry scientific data is required. Interestingly, every expert noted above participates in such exertion. Dr. Cureton, at age 71, still runs ultra-marathon distances and Indiana's Dr. Counsilman wins Masters swim competitions. It would appear that, all things considered, long-term physical exercise has a beneficial influence, especially if done in moderation.

Thin, small-boned people represented in sports by distance runners are genetically programmed to live longer than the general average.

All this may explain our present information, but it leaves still be be answered the question of whether or not an athletic program continuing into middle age has any effect on our longevity. Do athletes live longer than ex-athletes? Can the Longevity Quotient be enhanced by fitness and reduced by a life-style of overindulgence and psychological stress?

The answer to that, I suspect, is "yes." Such a premise is strengthened by the findings of Dr. Ernst van Aaken on the effects of maximal endurance running. Reviewing reports on 1000 members of the Association of Veteran Long Distance Runners between the ages of 40-90 from 29 countries, Dr. van Aaken did not find one case of a heart attack or cancer in five years of observation.

This almost incredible statement is supported by the work of Dr. Thomas Bassler who has found almost absolute immunity to coronary disease in runners actively competing at the marathon distance or training six miles or more per day.

The moral is obvious: Like everyone else, including the wife and kids, your body keeps asking, "Yes, but what have you done for me lately?"

Duncan MacLean (left), 89, and Sing Lum, 70—the two oldest competitors in the 1974 AAU Masters meet. Both are sprinters. (Charles Palmer photo)

AGE-GROUP PROGRAMS

Look back to 1960-65. It wasn't so long ago in the ways we usually measure time. Less than a generation has passed since then. But during that same period, many generations of runners have come and gone in a sport where until recently three or four years was a long career and age 25 was old.

In 1960-65, the New Zealanders were the best runners in the world. Murray Halberg, Peter Snell, Barrie Magee, John Davies, Bill Baillie all were world class. Jack Foster was older than them even then, yet he hadn't started running by the time the others were retiring.

Foster was 33 when he turned from serious bicycling to serious running. When he was 39, he set a world record for 20 miles. At 40, he placed eighth in the Olympic marathon. At 41, he was the Commonwealth Games silver medalist with the fastest marathon of his life (2:11:18).

No one as old as Foster had ever run as fast. Ten years ago, it's unlikely anyone would have tried because this wasn't the kind of thing 42-year-olds were expected to do. They rarely had the opportunity or the interest.

Jack Foster is an exceptional man, of course. Few men his age could run the way he runs, no matter how hard they might try. But Foster's success is partly due to changing ideas about running at "extreme" ages and a changing system to accommodate these new athletes—old and young. A runner doesn't have to be a Foster to benefit.

The change started coming, as so many of running's changes have, in the mid-1960s. That was the time when New Zealander Arthur Lydiard, Bill Bowerman and Dr. Kenneth Cooper of the US and others started saying, "Running is good for people. Not just fast people at their prime age, but all kinds of people at all ages." These people listened. Running grew. It grew fastest outside its old boundaries of school age and school-based competitive programs.

At younger ages, there was the added influence of age-group swimming and Little League. Running tried to imitate them—not entirely positive examples to follow, but tempting ones just the same.

Running for fitness and fun became competitive running on higher and higher levels. In the mid-1970s, young age-groupers had their own national AAU and Road Runners Club cross-country and track meets for children as young as five or six. Runners in their 70s have competed in the AAU Masters meets. The older people have a world championship marathon and 25-kilometer race in alternate years, and a track meet periodically.

Age records, an unheard of commodity in the 1960s, are a big deal in

the '70s. *Sports Illustrated* pictures a new record-holder nearly every week in "Faces in the Crowd." The magazines *Runner's World* (men's and women's marathon), *Track & Field News* (all men's events), *Women's Track & Field World* (all women's events) and *Starting Line* (young runners) all keep their own sets of marks for people as young as one and as old as they can survive.

We'll leave it to other books to show whether these people *should* be running. (Two earlier booklets in this series, *Running After Forty* and *The Young Runner*, have looked into the question of physical and psychological effects. Much more needs to be done.) Here, we're wanting to show what these runners can do and are doing. It is much more than anyone would have thought possible as little as 10 years ago.

In general, this much can be said of running in the early and pre-teens, and in middle and old age:

1. **Moderation is a virtue at any age.** Runners build up or tear down in relation to the stress applied. They develop problems when they go past their limits. Those limits may vary from age to age, but they are always present.

AGES OF THE WORLD'S BEST ATHLETES

Figures are based on the place-winners (top eight finishers in each event) at the 1972 Olympics, and the world-ranked athletes of 1973 (10 per event) as listed by **Track and Field News** and **Women's Track & Field World**. (H-hurdles; W-walk; sprints are races through 400m; middle distances are through 10,000m.)

Event	Men		Women	
	Olympics	World Rank	Olympics	World Rank
100m	23.8	23.4	22.5	23.9
100/110m H	24.5	23.5	26.9	26.6
200m	22.6	23.6	21.6	21.8
400m	23.6	23.4	22.0	23.7
400m H	24.4	23.3	--	--
800m	23.5	24.0	24.5	25.2
1500m	24.1	24.3	26.8	26.3
Steeple	25.4	25.6	--	--
5000m	26.5	26.1	--	--
10,000m	25.5	25.9	--	--
20km W	31.0	30.2	--	--
Marathon	31.3	28.9	--	26.5
50km W	29.3	29.0	--	--
Sprints	23.3	23.5	22.0	23.1
Mid-distance	25.0	25.2	25.7	25.6
Marathon	31.3	28.9	--	26.5
Walks	30.2	29.6	--	--
Hurdles	24.5	23.4	26.9	26.6
Overall	25.8	25.5	24.1	24.9

WILL WE LIVE LONGER?

BY GEORGE SHEEHAN, M.D.

Do athletes live longer than non-athletes? Will winning a letter in school add years to your life? Has early physical competence anything to do with later survival? Do sportsmen, in short, have a greater Longevity Quotient than their spectator classmates?

In a world whose disease is heart disease and whose best remedy may be exercise, such questions have increasing significance. Unfortunately, the answers the scientists come up with are yes, or no, or maybe.

Yes, writes Dr. Curtis Prout, who found that Yale and Harvard oarsmen lived over six years longer than randomly selected classmates.

No, claims Dr. Peter Schnorr, who discovered that 297 Danish champions who attained the age of 50 thereafter lived no longer than the average for the country.

Maybe, asserts Dr. Dale Largey, who studied life spans in "Who Was Who in American Sports" and found that athletes in certain sports—especially track—lived longer than the average.

The waters have been further muddied by Dr. Anthony Polednack, whose study of 6303 Harvard men pointed out that winning a letter might add years to your life—but only if it was in a minor sport. Major athletes according to Polednack, died significantly earlier than non-athletes from coronary heart disease, and perhaps earlier and more often from tumors.

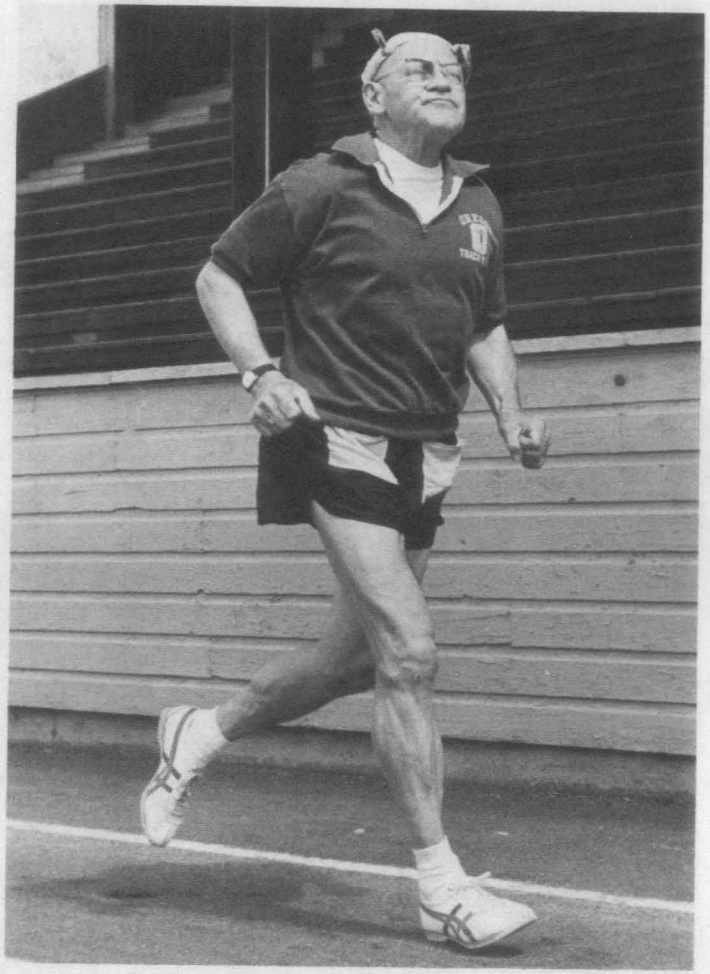
Despite these discrepancies and apparent disagreements, the whole question has, it seems to me, a fairly simple solution. None of the studies shows whether or not the athletes remained athletes. We can assume they didn't. Polls in England, where sports participation runs high, disclosed that only 10% of married men ages 23-30 continued their sports activities. Americans probably have an even worse record.

The question that these researchers are asking is, "Do ex-athletes live longer than non-athletes?" The answer is "Probably not." The differences detected by Drs. Prout, Schnorr, Polednack and Largey are simply the tendency of our population to have different life spans, based on body build. Your carcass, which anthropologist Earnest Hooten said is the best clue to your character, is also the best clue to your allotted life span.

The muscular, aggressive ex-football players are statistically susceptible to cardiovascular disease to just that degree shared by their muscular, aggressive non-athletic counterparts. Onlookers who share the magnificent physical and psychological attributes of crewmen will share in their extended life span.

4

Running and Aging



Larry Hilt, a marathoner in his 70s.

2. Runners tend to stay "up" only a few years. No matter what the age of starting, they show a pattern of racing well for 1-5 seasons then cutting back on effort or retiring. There are few exceptions.

Hal Higdon writes in *Runner's World*, "While the human body can be subjected to extremes in training, the human mind cannot... Three or four years seem to be the maximum for sustaining the high levels of training necessary for victory today."

Studies of world class athletes point to the same conclusion. The booklet *Racing Techniques* shows that more than half of the world-ranked athletes (10 per event over a five-year period) appear on the list only one year; only one in five enjoys more than a two-year stay on top.

Whether an athlete starts hard racing at 10 or 40, the same thing seems to happen because, as Higdon explains, "After a while, it becomes psychologically impossible to run twice a day, seven days a week, 365 days a year."

3. Anyone can compete, but few can win. "This is a democratic sport," an *RW* article on aging says, "and athletes of all ages can and should compete. But the fact will always remain that awards are handed out undemocratically, with the runners in their 20s taking almost all of them. This inequality alone is the best argument for separate competition and prizes at the extremes of age."

The youngest winner at the Munich Olympics was 19-year-old Monika Zehrt. The oldest was 33-year-old walker Peter Frenkel. Few medal winners were outside of their 20s. Statistics from the Olympics and from world rankings (see accompanying chart) indicate that the ages 23-25 are the peak ones for most track runners, 28-30 for long distance runners and race walkers.

While maximum endurance does tend to develop later than speed, there are reasons other than physical to explain why distance athletes are older than sprinters. The main one is that distance runner usually stay with the sport longer, increasing their chances of development.

It may well be that the best ages for all events are somewhat older than they now appear—maybe 25 or so for the sprinters and up to the early 30s for marathoners. But with maturity come responsibilities to family and job. And not many runners can or want to keep going to their theoretical "peak age."

At the highest levels, this is likely to remain a sport for athletes in their third decade—with an exception coming along occasionally to keep the rule from becoming too hard and fast.

Jack Foster with his 2:11 marathon at age 41 and Mel Pender with his 60-yard dash mark at 35 don't disprove the rule. They simply give hope to older runners and raise a question: "What could they have done under the same conditions years earlier?" Foster spent his earlier years on a bicycle. Pender spent some of his best ones fighting in Vietnam.

Coming down from Olympic and world record levels, the ages of winners and placers gradually spread out—but never so far that runners just past puberty and those approaching middle age can hope to win much. Some runners have to win or be close to winning to stay motivated. The have to measure themselves beside their peers.

This is where age-group competition comes in. It gives this opportunity to win or to compete favorably. If it gets more people into the sport and

keeps them active, it is worthwhile. And this it has accomplished.

The AAU in the United States now tries to equalize running with these age groupings: 9-and-under, 10-11, 12-13, 14-15, 16-19 for the young, and from 40 on up in five-year jumps for the old.

The system is good, as far as it goes. It takes into account that runners improve dramatically with each year when they're young, and decline gradually later on. Two-year divisions are needed early, while five-year categories are adequate at higher ages. (Until 1974, there was a 10-year spread in the Masters' age-groups, which was a bit much.)

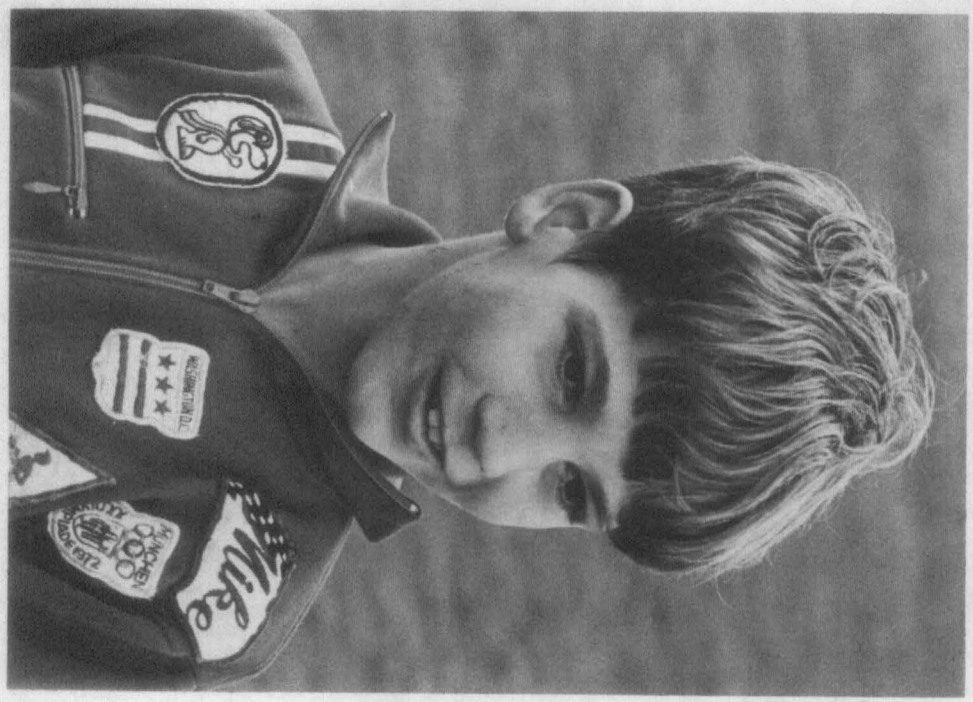
The most obvious gap is in the 30s. No special attention is given to this in-between age—too old in most cases to compete any longer with the kids, and too too young to join the veterans. No runner should have to be in this awkward position in the 1970s.

MARATHON

Age	1000	900	800	700	600	500	400
10	3:02:27	3:15:11	3:29:50	3:46:51	4:06:53	4:30:47	4:59:49
15	2:27:28	2:37:18	2:48:32	3:01:29	3:16:36	3:34:27	3:55:53
20	2:13:34	2:22:15	2:32:07	2:43:28	2:56:39	3:12:08	3:30:36
25	2:08:17	2:16:31	2:25:52	2:36:37	2:49:03	3:03:39	3:21:00
30	2:07:02	2:15:10	2:24:24	2:35:00	2:47:16	3:01:39	3:18:45
35	2:08:48	2:17:04	2:26:29	2:37:17	2:49:48	3:04:29	3:21:57
40	2:12:50	2:21:26	2:31:15	2:42:30	2:55:35	3:10:57	3:29:15
45	2:18:31	2:27:36	2:37:57	2:49:53	3:03:45	3:20:04	3:39:35
50	2:25:28	2:35:07	2:46:09	2:58:53	3:13:43	3:31:14	3:52:13
55	2:33:23	2:43:42	2:55:30	3:09:09	3:25:05	3:43:48	4:06:40
60	2:42:05	2:53:07	3:05:46	3:20:25	3:37:35	3:57:57	4:22:32
65	2:51:24	3:03:12	3:16:46	3:32:30	3:50:58	4:12:57	4:39:34
70	3:01:12	3:13:50	3:28:22	3:45:14	4:05:05	4:28:47	4:57:32
75	3:11:26	3:24:55	3:40:26	3:58:30	4:19:48	4:45:16	5:16:17
80	3:21:59	3:36:21	3:52:55	4:12:13	4:35:00	5:02:19	5:35:40
85	3:32:50	3:48:05	4:05:42	4:26:17	4:50:36	5:19:49	5:55:35

50 KILOMETERS

Age	1000	900	800	700	600	500	400
10	3:40:05	3:55:30	4:13:14	4:33:51	4:58:08	5:27:08	6:02:23
15	2:57:47	3:09:41	3:23:17	3:39:00	3:57:20	4:19:01	4:45:03
20	2:40:57	2:51:27	3:03:24	3:17:10	3:33:09	3:51:57	4:14:24
25	2:34:32	2:44:30	2:55:50	3:08:51	3:23:57	3:41:40	4:02:46
30	2:33:02	2:42:52	2:54:04	3:06:54	3:21:48	3:39:16	4:00:02
35	2:35:10	2:45:11	2:56:35	3:09:41	3:24:52	3:42:41	4:03:55
40	2:40:03	2:50:28	3:02:21	3:16:00	3:31:52	3:50:31	4:12:46
45	2:46:56	2:57:55	3:10:28	3:24:55	3:41:44	4:01:33	4:25:16
50	2:55:19	3:07:01	3:20:22	3:35:47	3:53:47	4:15:02	4:40:33
55	3:04:53	3:17:22	3:31:40	3:48:11	4:07:31	4:30:25	4:57:59
60	3:15:22	3:28:44	3:44:03	4:01:48	4:22:36	4:47:19	5:17:09
65	3:26:36	3:40:54	3:57:19	4:16:22	4:38:45	5:05:24	5:37:42
70	3:38:26	3:53:43	4:11:17	4:31:43	4:55:46	5:24:29	5:59:23
75	3:50:46	4:07:04	4:25:50	4:47:43	5:13:30	5:44:22	6:21:59
80	4:03:29	4:20:50	4:40:52	5:04:13	5:31:49	6:04:55	6:45:20
85	4:16:32	4:34:58	4:56:17	5:21:09	5:50:36	6:25:59	7:09:19



Age and Ability

2

PEAKING IN THE 20'S

BY GEORGE SHEEHAN, M.D.

Aging is a continuous, linear process. Body time does not bend. It is not relative; it is relentless. Our lives follow an appointed course. We may go gentle into that good night, but we will go and we will go at a predictable rate. Here and there, some slip through the net. A Picasso, a Grandma Moses, an occasional athlete, not a few ballerinas. But they are quirks of nature. For them, the bad genes are absent, as they are in those mountain people living in enclaves like Hunza and Vilcabamba and Abkhazia.

The rest of us echo the Psalmist: "Let me know, O Lord, my end and the number of my days that I may know how frail I am." That's what we want to know: exactly how frail we are, when we peak physically and what is in store for us in the future. What can we expect at one and 20, one and 40, one and 60, one and 80?

Some centuries back, Aristotle suggested that the physical acme occurred between the ages of 30 and 35. The intellectual acme he put later, at the age of 51. Aquinas set the end of youth and the beginning of wisdom at the age of 40. Only then, he thought, could a person become a philosopher. Clemenceau, remarked that everything he knew, he had learned after he was 30. There is, you see, a general agreement that aging has merits for the mind, as it does for fine wine.

But testing intelligence and imagination and creativity is a chancy business, and rarely convincing. It is not yet the science that scientists make out. Applied physiology is, on the other hand, at a point where very sophisticated measurements of bodily function can be made quite accurately. With such methods, we should get all the answers we need about when we peak and how fast we age.

Unfortunately, we don't get those answers. We can measure decreases in vital capacity, kidney function, near vision, basal metabolism, sense of taste, cardiac output and more. But we are not at all sure what those changes mean when it comes to overall performance of the human body. The question remains as to what the ordinary person can do in a real-life situation when he puts his mind and body into it.

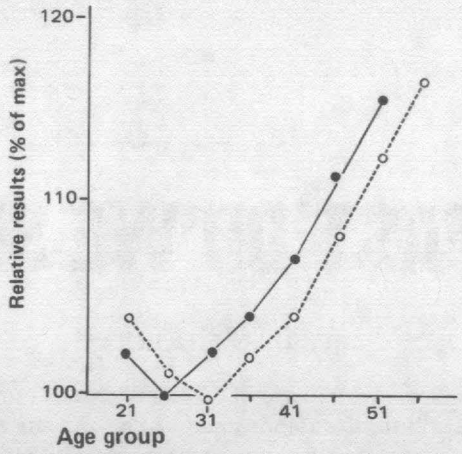
I think we finally are getting some answers. Dr. L. E. Bottiger, a professor of medicine at the Karolinska Hospital in Stockholm, has one answer. Bottiger took the problem out of the laboratories and onto the ski course of Vasa and the running course of Lidingo in Sweden. And in place of the 25 medical students in the usual experiment, the had 7625 skiers and 1911 runners—a

20 MILES

Age	1000	900	800	700	600	500	400
10	2:15:14	2:24:37	2:35:24	2:47:56	3:02:39	3:20:12	3:41:29
15	1:49:31	1:56:46	2:05:02	2:14:35	2:25:41	2:38:48	2:54:31
20	1:39:22	1:45:46	1:53:03	2:01:25	2:11:08	2:22:31	2:36:04
25	1:35:32	1:41:37	1:48:32	1:56:27	2:05:37	2:16:22	2:29:07
30	1:34:39	1:40:40	1:47:30	1:55:19	2:04:23	2:14:58	2:27:32
35	1:36:00	1:42:07	1:49:05	1:57:04	2:06:18	2:17:07	2:29:58
40	1:39:00	1:45:23	1:52:38	2:00:58	2:10:37	2:21:56	2:35:25
45	1:43:14	1:49:58	1:57:38	2:06:27	2:16:41	2:28:44	2:43:06
50	1:48:24	2:55:33	2:03:43	2:13:08	2:24:05	2:37:01	2:52:29
55	1:54:17	2:01:56	2:10:40	2:20:46	2:32:33	2:46:28	3:03:12
60	2:00:45	2:08:56	2:18:18	2:29:09	2:41:50	2:56:52	3:15:00
65	2:07:41	2:16:26	2:26:29	2:38:08	2:51:47	3:08:01	3:27:39
70	2:14:59	2:24:21	2:35:06	2:47:36	3:02:17	3:19:47	3:41:01
75	2:22:35	2:32:35	2:44:05	2:57:28	3:13:14	3:32:03	3:54:57
80	2:30:27	2:41:06	2:53:22	3:07:40	3:24:32	3:44:45	4:09:23
85	2:38:31	2:49:50	3:02:54	3:18:09	3:36:09	3:57:46	4:24:12

30 KILOMETERS

Age	1000	900	800	700	600	500	400
10	2:05:06	2:13:46	2:23:43	2:35:17	2:48:52	3:05:04	3:24:41
15	1:41:23	1:48:04	1:55:43	2:04:32	2:14:47	2:26:54	2:41:23
20	1:32:02	1:37:58	1:44:42	1:52:26	2:01:23	2:11:55	2:24:25
25	1:28:31	1:34:09	1:40:33	1:47:52	1:56:21	2:06:16	2:18:03
30	1:27:44	1:33:18	1:39:37	1:46:51	1:55:13	2:05:01	2:16:38
35	1:28:59	1:34:40	1:41:06	1:48:29	1:57:01	2:07:02	2:18:54
40	1:31:47	1:37:41	1:44:24	1:52:06	2:01:02	2:11:30	2:23:58
45	1:35:43	1:41:56	1:49:02	1:57:11	2:06:40	2:17:48	2:31:05
50	1:40:30	1:47:07	1:54:41	2:03:23	2:13:31	2:25:29	2:39:47
55	1:45:57	1:53:02	2:01:07	2:10:27	2:21:21	2:34:14	2:49:43
60	1:51:56	1:59:31	2:08:11	2:18:13	2:29:57	2:43:52	3:00:38
65	1:58:21	2:06:28	2:15:46	2:26:32	3:39:11	2:54:12	3:12:21
70	2:05:07	2:13:47	2:23:45	2:35:19	2:48:54	3:05:06	3:24:44
75	2:12:10	2:21:25	2:32:04	2:44:27	2:59:02	3:16:28	3:37:38
80	2:19:27	2:29:18	2:40:40	2:53:54	3:09:31	3:28:13	3:51:00
85	2:26:55	2:37:24	2:49:30	3:03:37	3:20:17	3:40:17	4:04:44



Relative results for men, given as per cent of maximum performance, for the Vasa ski race (--------) and for the Lidingo run (———).

cross-section of the population with regard to age, occupation, education, etc. And this was not just a few minutes on the treadmill. The Vasa race extends a distance of 87 kilometers (54 miles); Lidingo is a shorter, faster race of 30 kilometers (19 miles).

Bottinger sorted out the Vasa and Lidingo finishers into age groups of five years—starting with the 16-20 sample and ending with 61-65. Taking the mean time of these groups, he made two findings of great interest:

- The best performances (lowest times) were turned in by the 31-35-year-old skiers and the 26-30-year-old runners.
- The times rose from that point practically linearly with age (see chart). This decrease in performance came to approximately 6-7% every 10 years.

The younger age of the runners reflects the less demanding nature of the event. Lidingo is more purely physical. Vasa is a super-endurance race where technique and psychological factors play a larger role. And here age has the edge.

Taken together, these races tell us more than we ever knew about when a body peaks, and when and how fast its physical working capacity declines. Bottinger's work is a thing of beauty. The size of the sample is awesome, the statistics are beyond question, the experimental situation is unparalleled. But what thrills the reader more is the evidence of the enormous powers of the common man—and more particularly the *aging* common man.

Time may be relentless, but Vasa and Lidingo prove that we were not made to be spectators. We are continually capable of doing whatever we did in our prime—a little slower, perhaps, somewhat weaker, surely, but if they wait around long enough we'll finish.

HOW FAST DO WE SLOW?

BY DAN MOORE

Almost all runners over the age of 30 realize that as they get older their times will get slower. Intensive training may reduce the rate at which we slow down, and there may even be a few years where we are able to improve our times. But, inevitably, old man time will slow us down, and only in our dreams will we be setting personal records. Thus, we will search for new goals—ones that are related to our age.

Each year, the booklet *Age Records* (published by *Track & Field News)* lists marks for distances from 100 yards to the marathon. Runners buy the booklet so they can compare their own performances with the current records for their own age-group. That's why I bought my copy. Looking through the records, I soon realized I was just as far from the records at age 32 as I was when I was in college. I found it hard to believe that men in their 40s were still running the mile in the low 4:20s. To be a record holder with my time, I would have to keep running until age 50 and not slow down a single second.

This realization made me wonder about other uses of this compendium of age records. Perhaps they could be used to help answer the question, "How fast do we slow down?" In other words, knowing my times now, at age 32, can I predict my times at ages 40, 50 and even 60? (Like most runners, I plan to keep running for a long time.)

Luckily, since I am a working biostatistician and have access to some very large computers and some easy-to-use programs, it wasn't too hard to think of a way to assimilate all of this information into a single mathematical model. First, I punched all the running records on computer cards. Then I wrote a simple program to plot all the data for each distance on a graph. A study of the graphs led me to thinking that a single simple equation could be used to describe the relationship between age and running speed (where speed is determined by dividing distance in meters by time in seconds).

The curve described by the equation is nearly flat for ages 20-30, due to the balance between the speed increase and the speed decrease at these ages. A study of the curve for each racing distance reveals two interesting facts:

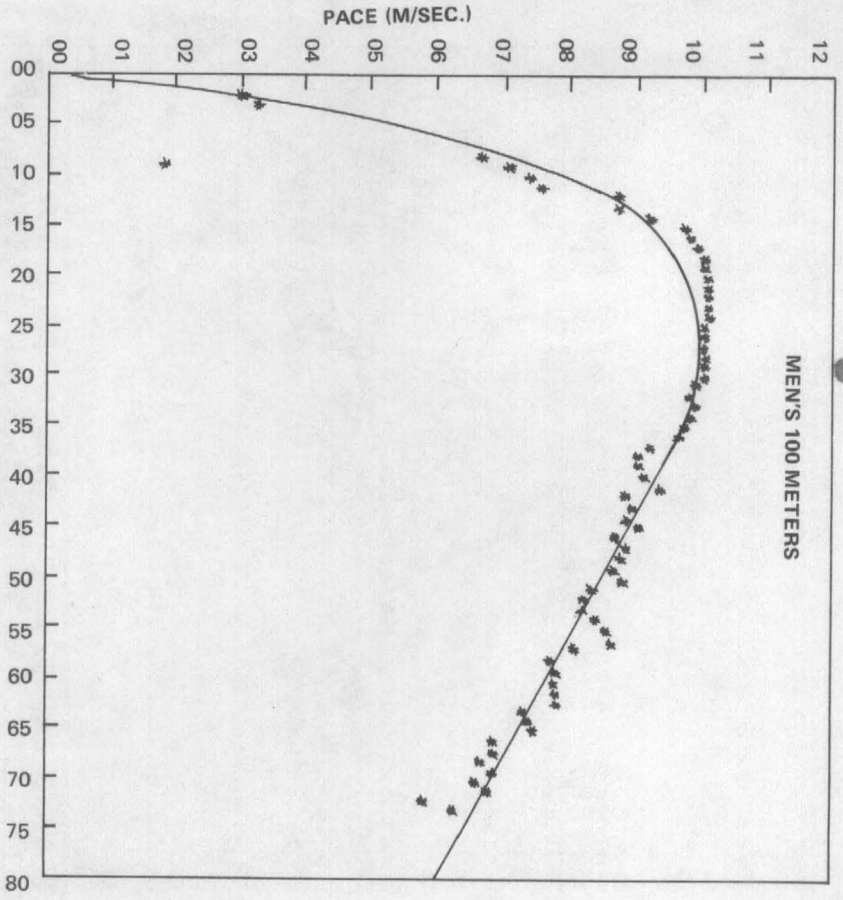
1. The age of best performance increases with distance. That is, sprinters are in their prime when they are in their early 20s while marathoners are best in their late 20s. World records for the 100, 200 and 400 meters are held by men aged 20, 23 and 21, respectively. The five-kilometer, 10-kilometer and marathon record holders are 24, 23 and 26 years old.

15 MILES

Age	1000	900	800	700	600	500	400
10	1:38:18	1:45:05	1:52:52	2:01:54	2:12:30	2:25:07	2:40:24
15	1:19:53	1:25:08	1:31:07	1:38:01	1:46:02	1:55:29	2:06:47
20	1:12:42	1:17:21	1:22:38	1:28:42	1:35:44	1:43:58	1:53:45
25	1:10:02	1:14:27	1:19:29	1:25:15	1:31:54	1:39:41	1:48:54
30	1:09:29	1:13:52	1:18:50	1:24:32	1:31:07	1:38:48	1:47:55
35	1:10:31	1:14:59	1:20:04	1:25:53	1:32:36	1:40:28	1:49:48
40	1:12:45	1:17:25	1:22:42	1:28:47	1:35:48	1:44:03	1:53:51
45	1:15:52	1:20:47	1:26:23	1:32:49	1:40:17	1:49:03	1:59:30
50	1:19:40	1:24:54	1:30:52	1:37:44	1:45:43	1:55:08	2:06:23
55	1:23:59	1:29:34	1:35:57	1:43:19	1:51:55	2:02:04	2:14:14
60	1:28:43	1:34:42	1:41:33	1:49:27	1:58:43	2:09:40	2:22:52
65	1:33:47	1:40:11	1:74:32	1:56:02	2:06:00	2:17:50	2:32:08
70	1:39:08	1:45:59	1:53:51	2:02:58	2:13:41	2:26:27	2:41:54
75	1:44:42	1:52:01	2:00:25	2:10:12	2:21:42	2:35:26	2:52:06
80	1:50:27	1:58:15	2:07:13	2:17:40	2:29:59	2:44:43	3:02:40
85	1:56:22	2:04:39	2:14:12	2:25:20	2:38:29	2:54:15	3:13:31

25 KILOMETERS

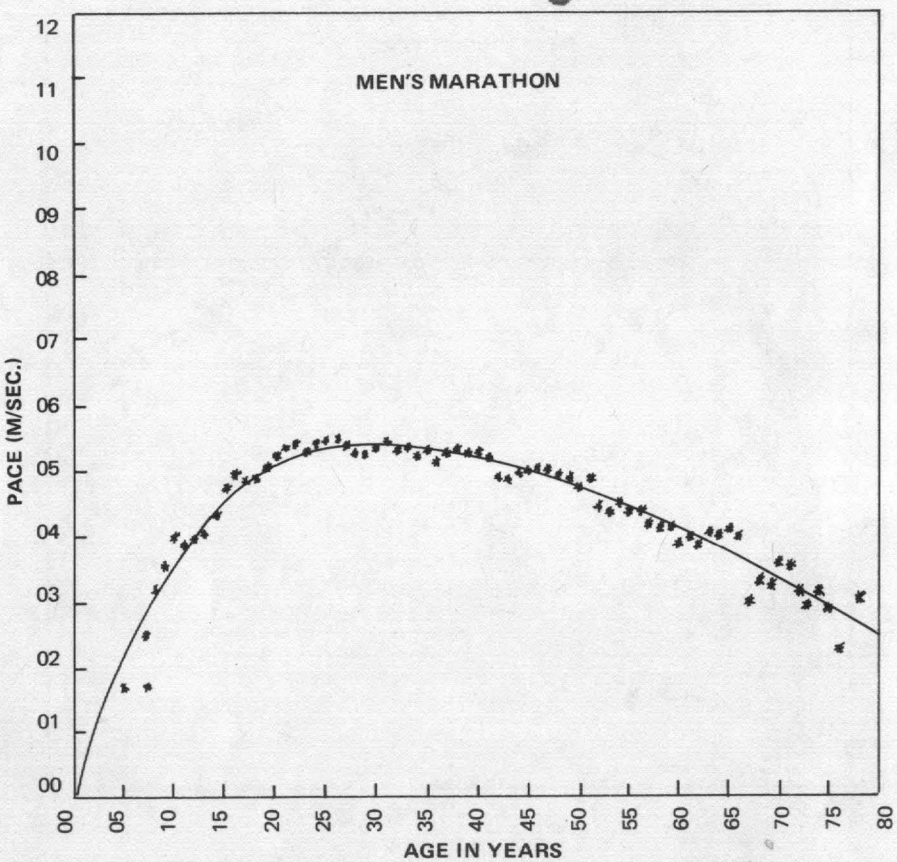
Age	1000	900	800	700	600	500	400
10	1:42:12	1:49:15	1:57:21	2:06:45	2:17:47	2:30:55	2:46:50
15	1:23:00	1:28:28	1:34:42	1:41:52	1:50:13	2:00:03	2:11:48
20	1:15:30	1:20:21	1:25:51	1:32:09	1:39:27	1:48:01	1:58:12
25	1:12:43	1:17:19	1:22:33	1:28:32	1:35:27	1:43:32	1:53:08
30	1:12:08	1:16:41	1:21:51	1:27:46	1:34:37	1:42:36	1:52:05
35	1:13:12	1:17:51	1:23:07	1:29:09	1:36:09	1:44:19	1:54:01
40	1:15:31	1:20:21	1:25:51	1:32:10	1:39:28	1:48:02	1:58:13
45	1:18:45	1:23:52	1:29:40	1:36:21	1:44:06	1:53:13	2:04:05
50	1:22:41	1:28:07	1:34:19	1:41:27	1:49:45	1:59:32	2:11:13
55	1:27:10	1:32:58	1:39:36	1:47:15	1:56:11	2:06:44	2:19:23
60	1:32:05	1:38:18	1:45:24	1:53:38	2:03:15	2:14:38	2:28:20
65	1:37:21	1:44:00	1:51:38	2:00:28	2:10:49	2:23:06	2:37:57
70	1:42:54	1:50:01	1:58:11	2:07:40	2:18:48	2:32:03	2:48:07
75	1:48:41	1:56:17	2:05:01	2:15:10	2:27:07	2:41:23	2:58:42
80	1:54:40	2:02:45	2:12:04	2:22:55	2:35:43	2:51:01	3:09:40
85	2:00:48	2:09:24	2:19:19	2:30:53	2:44:33	3:00:56	3:20:56



2. **We slow down more slowly at the longer distances.** For example, at age 50 in the 200-meter sprint the record holders are slowing at a rate of 0.09 meters per second per year, while the marathoners are slowing at a rate of only 0.05 meters per second per year. This observation has led me to believe that speed deteriorates faster than stamina with age. (That's why it's so hard to keep up with those grey-haired guys in the marathon.)

Another way of comparing the records is to convert each speed to a percentage of the world record for that event. For example, a 200-meter speed of 8.12 meters per second (equivalent to a time of 24.6) is 80% of the world record speed (10.15 m/sec), while a marathon speed of 4.38 m/sec (marathon time of 2:40:42) is also 80% of world record speed (5.47 m/sec). The results are shown in the table on page 21, which gives the predicted percentage of world record speed as a function of both age and distance of run.

Study of this table also reveals some interesting comparisons. For example, notice that a 20-year-old can beat a 40-year-old at 200 meters (speed is 98% of the record for the younger man while for the older man it is only 93%). But in the marathon, their standings are reversed (the 20-year-old hits 94% of the record while the 40-year-old gets 96%). A similar switching of speeds oc-



curs when 15-year-olds are compared with 50-year-olds, and for 10-year-olds compared with 65-year-olds at the same two distances. Thus, if grandson challenges grandpa to a race, he should keep it short, while if grandpa makes the challenge he should make it long (provided grandpa is still in shape, of course).

Since the table was computed entirely from age group *records,* it is meaningful to ask if it can be applied to individual runners who are not record holders. I believe that it can be, for the following reason. Imagine that there is a "super" runner, Sam Speedy, who stays in good condition his entire life and is always able to outrun anyone in his age-group. The record booklet can then be thought of as containing his best times. Now imagine an ordinary guy, Ronnie Runner, who cannot run as fast as Sam but is able to run at 80% of Sam's speed. It is reasonable to suppose that Ronnie's speed vs. age curve looks just like Sam's, only it is displaced so that at each age his speed is 80% of Sam's.

This reasoning assures us that anyone can use Table One by applying the percentage to *his own* personal records rather than to the *world* records. For example, suppose you are a miler and your collegiate best was 4:30. Say you want to predict your mile times at age 40. First, convert your college mile time to a speed in meters per second. (one mile = 1609.35 meters. 4:30 minutes = 270 seconds. Speed - 1609.35m/270 sec = 5.96 m/sec.)

ONE HOUR

Age	1000	900	800	700	600	500	400
10	9m 1093y	9m 120y	8m 905y	7m 1685y	7m 703y	6m 1477y	6m 487y
15	11m 967y	10m 1587y	10m 445y	9m 1059y	8m 1670y	8m 518y	7m 1124y
20	12m 986y	11m 1519y	11m 288y	10m 814y	9m 1337y	9m 97y	8m 613y
25	12m 1739y	12m 472y	11m 961y	10m 1446y	10m 168y	9m 646y	8m 1122y
30	13m 130y	12m 610y	11m 1085y	10m 1556y	10m 263y	9m 727y	8m 1187y
35	12m 1559y	12m 285y	11m 767y	10m 1245y	9m 1719y	9m 429y	8m 895y
40	12m 892y	11m 1401y	11m 146y	10m 647y	9m 1143y	8m 1635y	8m 363y
45	12m 31y	11m 573y	10m 1110y	9m 1643y	9m 413y	8m 938y	7m 1459y
50	11m 834y	10m 1415y	10m 232y	9m 804y	8m 1372y	8m 177y	7m 737y
55	10m 1609y	10m 472y	9m 1091y	8m 1705y	8m 557y	7m 1164y	7m 8y
60	10m 637y	9m 1303y	9m 206y	8m 865y	7m 1520y	7m 412y	6m 1060y
65	9m 1462y	9m 412y	8m 1118y	8m 61y	7m 761y	6m 1457y	6m 390y
70	9m 579y	8m 1331y	8m 321y	7m 1067y	7m 49y	6m 789y	5m 1526y
75	8m 1512y	8m 546y	7m 1337y	7m 364y	6m 1149y	6m 170y	5m 949y
80	8m 744y	7m 1578y	7m 648y	6m 1475y	6m 539y	5m 1361y	5m 420y
85	8m 34y	7m 904y	7m 12y	6m 876y	5m 1739y	5m 838y	5m 1695y

20 KILOMETERS

Age	1000	900	800	700	600	500	400
10	1:19:46	1:25:15	1:31:32	1:38:49	1:47:22	1:57:32	2:09:49
15	1:05:01	1:09:16	1:14:06	1:19:41	1:26:10	1:33:48	1:42:54
20	0:59:19	1:03:05	1:07:23	1:12:18	1:18:00	1:24:40	1:32:34
25	0:57:14	1:00:50	1:04:55	1:09:36	1:15:01	1:21:20	1:28:48
30	0:56:51	1:00:25	1:04:28	1:09:06	1:14:28	1:20:43	1:28:07
35	0:57:44	1:01:23	1:05:32	1:10:16	1:15:44	1:22:09	1:29:44
40	0:59:36	1:03:24	1:07:43	1:12:40	1:18:24	1:25:07	1:33:05
45	1:02:10	1:06:10	1:10:45	1:15:59	1:22:05	1:29:13	1:37:44
50	1:05:16	1:09:32	1:14:24	1:20:01	1:26:32	1:34:12	1:43:22
55	1:08:48	1:13:22	1:18:35	1:24:35	1:31:36	1:39:52	1:49:48
60	1:12:40	1:17:33	1:23:09	1:29:36	1:37:09	1:46:05	1:56:50
65	1:16:48	1:22:02	1:28:02	1:34:58	1:43:06	1:52:45	2:04:24
70	1:21:10	1:26:46	1:33:11	1:40:38	1:49:23	1:50:47	2:12:23
75	1:25:43	1:31:41	1:38:33	1:46:32	1:55:55	2:07:07	2:20:43
80	1:30:25	1:36:47	1:44:04	1:52:38	2:02:41	2:14:42	2:29:20
85	1:35:14	1:42:00	1:49:48	1:58:55	2:09:38	2:22:29	2:38:11

AGE-RECORD SPEED AS A PERCENTAGE OF WORLD RECORD SPEED (FOR MEN)

Age	100m	200m	400m	800m	1500m	3000m	5000m	10km	Marath.	HH	IH
5	52	51	50	51	50	44	47	46	41	45	49
10	79	79	78	78	72	74	74	73	67	73	77
15	92	92	92	92	92	88	89	89	84	89	92
20	98	98	98	98	99	96	97	97	94	97	98
25	100	100	100	100	100	100	100	100	99	100	100
30	99	99	99	99	99	100	100	100	100	99	98
35	97	96	96	96	96	98	97	98	99	94	95
40	93	93	92	92	92	94	93	94	96	88	90
45	90	89	88	88	87	89	88	90	92	80	84
50	86	84	83	83	82	83	83	85	88	71	77
55	81	79	77	78	77	77	77	79	82	61	70
60	77	74	71	72	71	71	70	73	76	50	62
65	73	69	65	66	66	64	64	66	70	38	54
70	68	64	59	60	60	57	56	59	63	26	46
75	63	58	53	54	54	49	49	51	55	13	37
80	58	53	46	48	48	42	41	43	48	—	—

Using 1500 meters as a rough approximation to a mile, Table One shows that at age 40 you could be running the mile at 92% of your record speed. (This assumes that your speed will deteriorate at the same rate as the record-holders'.) Thus, you calculate age 40 speed at 5.48 m/sec or 4:53.5 for the mile, your predicted mile time at age 40.

Before you go out and try to run this predicted time, remember that it is also necessary that you train just as hard at age 40 relative to the age 40 record holder as you did at age 20 relative to the age 20 record holder. If you do run a mile and your time is slower than predicted, you are probably not in as good shape, relative to the record holder, as you were at age 20. On the other hand, if you run faster than predicted, you are probably in better condition, for your age, than you were at age 20.

WOMEN'S RECORDS

Women's age-group records are also available (from *Women's Track and Field World*) for running events 100 yards through 3000 meters. Although there are not many records for women over 40, the data can still be fit by our equation and converted to percentages of world records. The results for women are shown in the table below.

Age	100	200	400	800	1500	3000	100H
5	57	54	53	56	57	49	43
10	84	82	81	83	84	78	72
15	96	95	94	95	96	93	89
20	100	99	99	99	100	99	98
25	100	100	100	100	99	100	100
30	97	98	98	98	96	95	97
35	94	94	94	95	92	89	90
40	90	89	90	91	87	80	80
45	85	84	85	87	81	69	67
50	80	79	79	83	75	58	51
55	75	73	73	78	68	46	33
60	69	67	67	73	61	33	12

A comparison of the table for men (page 21) with the table for women reveals that below age 13 or so girls are just as fast as boys, and in some events faster. For example, girls' eight-, nine- and 11-year records are 69.5, 64.4 and 59.4 in the 400 meters which are faster than the boys' records 70.2, 66.2 and 59.7. However, beyond age 13, boys improve at a faster rate than girls and attain faster speeds in all distances. Although the data for women is scanty, the table for women shows that women lose their speed at a faster rate than men, so that the differences between men's and women's records increases with age. Perhaps this observaton will not prove valid once more women start competing in master's events and their records improve.

10 MILES

Age	1000	900	800	700	600	500	400
10	1:02:38	1:06:55	1:11:49	1:17:30	1:24:10	1:32:04	1:41:38
15	0:51:15	0:54:35	0:58:23	1:02:44	1:07:49	1:13:46	1:20:53
20	0:46:55	0:49:53	0:53:16	0:57:08	1:01:36	1:06:50	1:13:02
25	0:45:22	0:48:13	0:51:27	0:55:08	0:59:23	1:04:22	1:10:14
30	0:45:09	0:47:58	0:51:10	0:54:50	0:59:03	1:03:59	1:09:49
35	0:45:54	0:48:47	0:52:04	0:55:49	1:00:09	1:05:12	1:11:11
40	0:47:24	0:50:25	0:53:50	0:57:46	1:02:18	1:07:36	1:13:54
45	0:49:27	0:52:38	0:56:16	2:00:25	1:05:14	1:10:54	1:17:37
50	0:51:56	0:55:19	0:59:11	1:03:37	1:08:47	1:14:52	1:22:07
55	0:54:44	0:58:21	1:02:29	1:07:15	1:12:49	1:19:22	1:27:13
60	0:57:48	1:01:41	1:06:07	1:11:14	1:17:13	1:24:18	1:32:48
65	1:01:05	1:05:14	1:09:59	1:15:29	1:21:56	1:29:34	1:38:47
70	1:04:32	1:08:59	1:14:04	1:19:58	1:26:54	1:35:09	1:45:07
75	1:08:09	1:12:53	1:18:19	1:24:39	1:32:05	1:40:57	1:51:42
80	1:11:52	1:16:55	1:22:43	1:29:28	1:37:26	1:46:57	1:58:31
85	1:15:41	1:21:03	1:27:14	1:34:26	1:42:56	1:53:07	2:05:32

15 KILOMETERS

Age	1000	900	800	700	600	500	400
10	0:57:55	1:01:52	1:06:23	1:11:38	1:17:46	1:25:04	1:33:52
15	0:47:27	0:50:32	0:54:02	0:58:04	1:02:45	1:08:15	1:14:48
20	0:43:30	0:46:15	0:49:22	0:52:57	0:57:05	1:01:55	1:07:38
25	0:42:06	0:44:44	0:47:43	0:51:08	0:55:05	0:59:41	1:05:07
30	0:41:54	0:44:32	0:47:30	0:50:53	0:54:48	0:59:22	1:04:46
35	0:42:38	0:45:18	0:48:21	0:51:49	0:55:50	1:00:31	1:06:04
40	0:44:02	0:46:50	0:50:00	0:53:38	0:57:51	1:02:46	1:08:37
45	0:45:57	0:48:54	0:52:15	0:56:07	1:00:35	1:05:50	1:12:04
50	0:48:14	0:51:23	0:54:58	0:59:06	1:03:53	1:09:31	1:16:15
55	0:50:51	0:54:12	0:58:03	1:02:28	1:07:37	1:13:42	1:20:58
60	0:53:41	0:57:17	1:01:24	1:06:09	1:11:42	1:18:16	1:26:10
65	0:56:44	1:00:35	1:05:00	1:10:06	1:16:05	1:23:10	1:31:43
70	0:59:57	1:04:04	1:08:47	1:14:16	1:20:41	1:28:20	1:37:35
75	1:03:17	1:07:41	1:12:44	1:18:36	1:25:30	1:33:43	1:43:41
80	1:06:44	1:11:25	1:16:48	1:23:04	1:30:27	1:39:17	1:50:01
85	1:10:16	1:15:15	1:20:59	1:27:40	1:35:33	1:45:00	1:56:31

3 Age-Graded Scoring

Bud Deacon, a champion in his 60s. (Jack Bacheler)

TURNING THE TABLES

BY KEN YOUNG

This chapter presents a formulation which relates age, distance and performance on a quantitative basis. This makes it possible to assess the relative merits of, say, a 4:03 mile at age 25 and a 5:00 mile at age 55. (The latter is better, 925 points to 900).

The performances are scored using the Age-Graded Tables I have devised. These formulations are empirically determined, using statistical techniques, and are based on current world age-group records for distances 800 meters to 50 kilometers.

The use of the tables presented here is rather straightforward. Locate the age-group and proceed to the right until you find times which bracket the performance. If the exact ages and times lie between the given figures, two-way interpolation is necessary. (More complete tables are also available. See details at the end of this introduction.)

Those of us on the gray side of 30 are faced with an expected decline in our performances as we get older. There is an obvious limit to improvement judged strictly on a time basis. But relative performance, measured against runners the same age, never needs to deteriorate. Thus, these tables can be used to assess realistically one's training program, removing the effects of aging. As long as your point levels continue to increase, your training program is doing its job.

Similarly, a teenage runner may improve in absolute performance while becoming less competitive in his age-group if his point level declines. All runners should relate their improvement to point levels as well as absolute performance.

These tables are based on performances for men for the simple reason that there is much more data available for men than for women. Although the data for women is accumulating rapidly, it is still a long way from being suitable for an analysis similar to this.

More detailed tables are available, giving performances at every 10 points from 200-1100 points for each year from 5-90. These tables for any one of the standard distances, 800 meters to 50 kilometers, sell for $2.50 each.

Also available are tables giving performance levels 200-1100 points at 10-point intervals for 20 different distances. Each table covers a single age. The cost is $1.00.

Tables may be obtained from John Lesch, 4620 North Kenneth, Chicago, Ill. 60630.

SIX MILES

Age	1000	900	800	700	600	500	400
10	35:24.4	37:47.6	40:31.4	43:40.9	47:22.3	51:44.6	57:00.2
15	29:18.0	31:10.8	33:19.0	35:46.0	38:36.5	41:56.3	45:53.9
20	27:05.2	28:47.0	30:42.3	32:54.1	35:26.2	38:23.8	41:53.7
25	26:22.0	28:00.1	29:51.3	31:58.1	34:24.3	37:14.7	40:35.6
30	26:21.1	27:59.1	29:50.2	31:56.9	34:23.0	37:13.2	40:34.0
35	26:52.6	28:33.3	30:27.4	32:37.8	35:08.2	38:03.7	41:31.0
40	27:48.3	29:33.6	31:33.1	33:49.9	36:28.0	39:32.7	43:11.5
45	29:01.9	30:53.4	33:00.0	35:25.2	38:13.4	41:30.6	45:24.7
50	30:29.4	32:28.1	34:43.2	37:18.5	40:18.8	43:50.7	48:03.3
55	32:07.8	34:14.6	36:39.4	39:26.0	42:40.0	46:28.6	51:02.1
60	33:55.0	36:10.8	38:45.9	41:45.0	45:13.9	49:20.8	54:17.2
65	35:49.4	38:14.6	41:01.0	44:13.3	47:58.2	52:24.8	57:45.8
70	37:49.6	40:24.9	43:23.0	46:49.2	50:51.0	55:38.4	1:01:25.5
75	39:54.8	42:40.4	45:50.7	49:31.6	53:51.0	1:00:80.0	1:05:14.4
80	42:03.9	45:00.3	48:23.2	52:19.1	56:56.8	1:02:28.3	1:09:11.0
85	44:16.4	47:23.9	51:59.8	55:11.1	1:00:07.5	1:06:02.1	1:13:14.1

10,000 METERS

Age	1000	900	800	700	600	500	400
10	36:49.3	39:18.3	42:08.9	45:26.2	49:16.8	53:50.0	59:18.8
15	30:26.7	32:24.0	34:37.3	37:10.4	40:07.7	43:35.7	47:43.0
20	28:07.5	29:53.2	31:53.1	34:10.1	36:48.3	39:52.0	43:31.2
25	27:21.8	29:03.7	30:59.2	33:11.0	35:42.8	38:39.8	42:08.7
30	27:20.3	29:02.1	30:57.4	33:09.0	35:40.7	38:37.4	42:06.0
35	27:52.7	29:37.2	31:35.4	33:59.9	36:27.0	39:29.2	43:04.4
40	28:50.2	30:39.5	32:43.5	35:05.4	37:49.4	41:01.2	44:48.3
45	30:06.5	32:02.1	34:13.4	36:44.1	39:38.7	43:03.2	47:06.3
50	31:37.1	33:40.2	36:00.4	38:41.6	41:48.7	45:28.5	49:50.7
55	33:19.2	35:30.8	38:00.9	40:53.8	44:15.1	48:12.3	52:56.1
60	35:10.4	37:31.3	40:12.2	43:18.0	46:54.8	51:11.0	56:18.6
65	37:09.1	39:39.8	42:32.4	45:51.9	49:45.3	54:21.9	59:55.1
70	39:14.0	41:55.0	45:59.8	48.33.8	52:44.7	57:42.0	1:03:43.1
75	41:23.9	44:15.7	47:33.2	51:22.3	55:51.5	1:01:12.2	1:07:40.7
80	43:37.9	46:41.0	50:11.5	54:16.3	59:04.4	1:04:48.4	1:11:46.4
85	45:55.5	49:10.0	52:54.0	57:14.9	1:02:22.4	1:08:30.5	1:15:58.8

880 YARDS

Age	1000	900	800	700	600	500	400
10	2:03.5	2:11.0	2:19.5	2:29.1	2:40.2	2:53.0	3:08.1
15	1:47.7	1:53.9	2:00.8	2:08.7	2:17.6	2:27.8	2:39.7
20	1:43.9	1:49.7	1:56.3	2:03.7	2:12.1	2:21.7	2:32.9
25	1:43.7	1:49.6	1:56.1	2:03.5	2:11.9	2:21.5	2:32.6
30	1:45.3	1:51.3	1:58.0	2:05.6	2:14.2	2:24.1	2:35.5
35	1:48.5	1:54.7	2:01.7	2:09.6	2:18.7	2:29.0	2:41.1
40	1:52.7	1:59.3	2:06.7	2:15.1	2:24.7	2:35.7	2:48.6
45	1:57.8	2:04.8	2:12.7	2:21.7	2:31.9	2:43.8	2:57.7
50	2:03.6	2:11.1	2:19.5	2:29.2	2:40.2	2:53.1	3:08.1
55	2:10.0	2:18.0	2:27.1	2:37.5	2:49.4	3:03.3	3:19.7
60	2:16.9	2:25.5	2:35.3	2:46.4	2:59.3	3:14.4	3:32.2
65	2:24.3	2:33.5	2:44.0	2:56.0	3:09.9	3:26.1	3:45.5
70	2:32.0	2:41.9	2:53.1	3:06.0	3:20.9	3:38.5	3:59.5
75	2:40.0	2:50.6	3:02.6	3:16.4	3:32.5	3:51.4	4:14.1
80	2:48.4	3:59.6	3:12.4	3:27.2	3:44.4	4:04.8	4:29.2
85	2:56.9	3:08.8	3:22.5	3:38.3	3:56.7	4:18.5	4:44.8

1500 METERS

Age	1000	900	800	700	600	500	400
10	4:15.9	4:31.9	4:50.2	5:11.1	5:35.2	6:03.3	6:36.6
15	3:41.8	3:55.0	4:10.0	4:27.0	4:46.4	5:08.9	5:35.2
20	3:32.9	3:45.4	3:59.5	4:15.5	4:33.7	4:54.8	5:19.3
25	3:32.2	3:44.6	3:58.7	4:14.5	4:32.7	4:53.6	5:18.1
30	3:35.4	3:48.1	4:02.5	4:18.7	4:37.3	4:58.8	5:23.8
35	3:42.0	3:55.2	4:10.2	4:27.2	4:46.7	5:09.2	5:35.6
40	3:50.8	4:04.8	4:20.7	4:38.7	4:59.3	5:23.3	5:51.5
45	4:01.5	4:16.4	4:33.3	4:52.5	5:14.6	5:40.4	6:10.8
50	4:13.7	4:29.6	4:47.6	5:08.3	5:32.1	6:59.8	6:32.7
55	4:27.1	4:44.1	5:03.4	5:25.6	5:51.2	6:21.2	6:56.9
60	4:41.4	5:59.7	5:20.4	5:44.2	6:11.8	6:44.3	7:22.9
65	4:56.7	5:16.1	5:38.3	6:03.9	6:33.7	7:08.7	7:50.6
70	5:12.6	5:33.4	5:57.1	6:24.6	6:56.5	7:34.3	8:19.6
75	5:29.1	5:51.3	6:16.7	6:46.0	7:20.3	8:00.8	8:49.7
80	5:46.2	6:09.7	6:36.8	7:08.1	7:44.7	8:28.3	9:20.8
85	6:03.6	6:28.7	6:57.4	7:30.8	8:09.9	8:56.4	9:52.8

THREE MILES

Age	1000	900	800	700	600	500	400
10	16:13.9	17:18.2	18:31.5	19:56.0	21:34.4	23:30.4	25:49.3
15	13:40.8	14:32.4	15:30.9	16:37.7	17:54.9	19:25.1	21:11.7
20	12:50.5	13:37.8	14:31.4	15:32.5	16:42.8	18:04.6	19:40.8
25	12:37.5	13:23.8	14:16.1	15:15.7	16:24.2	17:43.8	19:17.4
30	12:42.3	13:29.0	14:21.7	15:21.9	16:31.1	17:51.5	19:26.1
35	13:01.1	13:49.4	14:44.9	15:46.3	16:58.1	18:21.6	20:00.1
40	13:30.2	14:20.9	15:18.3	16:24.0	17:39.7	19:08.1	20:52.6
45	14:07.0	15:00.7	16:01.7	17:11.6	18:32.4	20:06.9	21:59.0
50	14:49.8	15:47.1	16:52.2	18:07.0	19:33.7	21:15.5	23:16.5
55	15:37.4	16:38.6	17:48.4	19:08.7	20:42.0	22:31.8	24:42.9
60	16:28.9	17:34.4	18:49.2	20:15.4	21:55.9	23:54.5	26:16.6
65	17:23.6	18:33.7	19:53.8	21:26.4	23:14.5	25:22.4	27:56.3
70	18:21.0	19:35.8	21:01.6	22:40.8	24:36.9	26:54.8	29:41.0
75	19:20.6	20:40.4	22:11.0	23:58.1	26:02.6	28:30.7	31:29.9
80	20:22.0	21:46.9	23:24.5	25:17.8	27:30.9	30:09.7	33:22.3
85	21:25.0	22:55.1	24:38.8	26:39.5	29:01.5	31:51.3	35:17.7

5000 METERS

Age	1000	900	800	700	600	500	400
10	16:53.3	18:00.2	19:16.6	20:44.6	22:27.1	24:28.1	26:52.9
15	14:13.2	15:06.8	16:07.6	17:17.2	18:37.6	20:11.5	22:02.6
20	13:20.2	14:09.4	15:05.1	16:08.6	17:21.8	18:46.8	20:27.0
25	13:06.3	13:54.4	14:48.7	15:50.7	17:01.9	18:24.6	20:02.0
30	13:11.0	13:59.5	14:54.3	15:56.8	17:08.6	18:32.1	20:10.4
35	13:30.4	14:20.5	15:17.2	16:21.9	17:36.4	19:03.1	20:45.4
40	14:00.5	14:53.1	15:52.7	17:00.8	18:19.4	19:51.2	21:39.6
45	14:38.6	15:34.3	16:37.6	17:50.1	19:14.0	20:52.1	22:48.5
50	15:22.9	16:22.4	17:30.0	18:47.6	20:17.6	22:03.2	24:08.9
55	16:12.3	17:15.9	18:28.3	19:51.6	21:28.4	23:22.4	25:38.5
60	17:05.8	18:13.8	19:31.4	21:00.9	22:45.2	24:48.2	27:15.7
65	18:02.6	19:15.3	20:38.4	22:14.5	24:06.7	26:19.5	28:59.2
70	19:02.2	20:19.8	21:48.8	23:31.8	25:32.3	27:55.4	30:47.9
75	20:04.0	21:26.8	23:01.8	24:52.0	27:01.2	29:35.0	32:41.0
80	21:07.8	22:35.9	24:17.2	26:14.8	28:33.0	31:17.8	34:37.8
85	22:13.2	23:46.7	25:34.4	27:39.6	30:07.1	33:03.3	36:37.7

ONE MILE

Age	1000	900	800	700	600	500	400
10	4:37.6	4:55.1	5:15.0	5:37.7	6:04.0	6:34.7	7:11.1
15	4:00.3	4:14.7	4:31.0	4:49.5	5:10.6	5:35.2	6:03.9
20	3:50.4	4:04.0	4:19.3	4:36.7	4:56.6	5:19.5	5:46.2
25	3:49.5	4:03.1	4:18.3	4:35.6	4:55.3	5:18.1	5:44.6
30	3:53.0	4:06.8	4:22.3	4:40.0	5:00.2	5:23.5	5:50.8
35	4:00.0	4:14.4	4:30.7	4:49.1	5:10.3	5:34.7	6:03.4
40	4:09.6	4:24.8	4:42.0	5:01.5	5:24.0	5:50.0	6:20.7
45	4:21.2	4:37.3	4:55.6	5:16.5	5:40.5	6:08.5	6:41.5
50	4:34.4	4:51.6	5:11.2	5:33.5	5:59.4	6:29.6	7:05.3
55	4:48.8	5:07.3	5:28.3	5:52.3	6:20.1	6:52.7	7:31.4
60	5:04.4	5:24.2	5:46.6	6:12.5	6:42.4	7:17.7	8:59.7
65	5:20.9	5:42.0	6:06.1	6:33.8	7:06.1	7:44.1	8:29.6
70	5:38.1	6:00.7	6:26.4	6:56.2	7:30.8	8:11.8	9:01.0
75	5:56.0	6:20.1	6:47.6	7:19.4	7:56.5	8:40.6	9:33.6
80	6:14.5	6:40.0	7:09.3	7:43.3	8:23.0	9:10.3	10:07.3
85	6:33.4	7:00.5	7:31.7	8:07.8	8:50.2	9:40.7	10:41.9

3000 METERS

Age	1000	900	800	700	600	500	400
10	9:27.4	10:04.2	10:46.1	11:34.2	12:30.1	13:35.8	14:54.1
15	8:04.3	8:34.2	9:08.1	9:46.7	10:31.1	11:22.8	12:23.8
20	7:39.3	8:07.1	8:38.6	9:14.3	9:55.3	10:42.9	11:38.8
25	7:34.5	8:01.9	8:32.9	9:08.1	9:48.5	10:35.3	11:30.2
30	7:39.4	8:07.2	8:38.7	9:14.4	9:55.5	10:43.1	11:38.9
35	7:52.1	8:21.0	8:53.7	9:30.9	10:13.7	11:03.4	12:01.8
40	8:10.5	8:40.9	9:15.3	9:54.6	10:39.9	11:32.6	12:34.9
45	8:33.1	9:05.4	9:42.0	10:23.9	11:12.3	12:08.8	13:15.7
50	8:59.1	9:33.5	10:12.6	10:57.5	11:49.5	12:50.4	14:02.7
55	9:27.8	10:04.6	10:46.5	11:34.7	12:30.6	13:36.3	14:54.7
60	9:58.7	10:38.1	11:23.0	12.14.8	13:15.0	14:26.0	15:50.9
65	10:31.5	11:13.6	12:01.7	12:57.3	14:02.1	15:18.6	16:50.6
70	11:05.8	11:50.8	12:42.2	13:41.8	14:51.4	16:13.8	17:53.1
75	11:41.4	12:29.3	13:24.3	14:27.9	15:42.5	17:11.2	18:58.2
80	12:18.1	13:09.1	14:07.6	15:15.5	16:35.3	18:10.3	20:05.3
85	12:55.7	13:49.8	14:52.0	16:04.3	17:29.4	19:10.9	21:14.2

TWO MILES

Age	1000	900	800	700	600	500	400
10	10:14.8	10:54.7	11:40.3	12:32.6	13:33.4	14:44.9	16:01.1
15	8:43.8	9:16.2	9:52.9	10:34.8	11:23.1	12:19.3	13:25.6
20	8:16.0	8:46.2	9:20.2	9:58.9	10:43.3	11:34.9	12:35.5
25	8:10.4	8:40.1	9:13.5	9:51.6	10:35.3	11:26.0	12:25.4
30	8:15.4	8:45.4	9:19.4	9:58.0	10:42.4	11:33.9	12:34.4
35	8:28.9	9:00.1	9:35.4	10:15.5	11:01.8	11:55.5	12:58.7
40	8:48.6	9:21.4	9:58.6	10:41.0	11:29.9	12:26.9	13:34.1
45	9:12.9	9:47.7	10:27.2	11:12.5	12:04.7	13:05.7	14:18.0
50	9:40.9	10:18.0	11:00.3	11:48.7	12:44.8	13:50.6	15:08.7
55	10:11.8	10:51.6	11:36.8	12:28.8	13:29.2	14:40.2	16:04.8
60	10:45.2	11:27.7	12:16.2	13:12.1	14:17.1	15:33.7	17:05.4
65	11:20.6	12:06.0	12:58.0	13:57.9	15:07.9	16:30.6	18:09.8
70	11:57.6	12:46.2	13:41.7	14:45.9	16:01.1	17:30.2	19:17.4
75	12:36.1	13:27.8	14:27.1	15:35.8	16:56.3	18:32.0	20:27.6
80	13:15.7	14:10.7	15:13.9	16:27.2	17:53.3	19:35.9	21:40.1
85	13:56.3	14.54.7	16:01.8	17:19.9	18:51.7	20:41.3	22:54.5