

跑步总动员

WHY IS RUNNING GOOD FOR YOU?

- Health, weight loss, self-challenge, and more...

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Introduction

Running and Weight
Loss

Why running helps?
Good strategies
Formulas

Running and Health
Improved heart
Strengthened bones
Boosted immunity
And More...

Ready to Get Started?

Choose your shoes
Improve forms
Make schedules
Go out and enjoy

Running A Marathon
What is a marathon?
What is the point?
How is it possible?
Torture of your body?

References

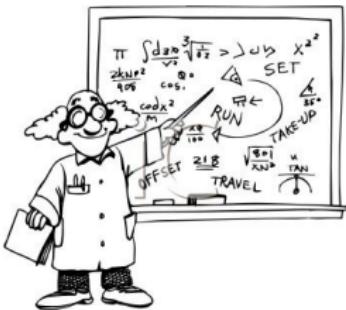
About Myself

Education

- ▶ B.E. in Electrical Engineering, Tsinghua University
 - ▶ M.S. & Ph.D. in Operations Research, Columbia University

As a professor

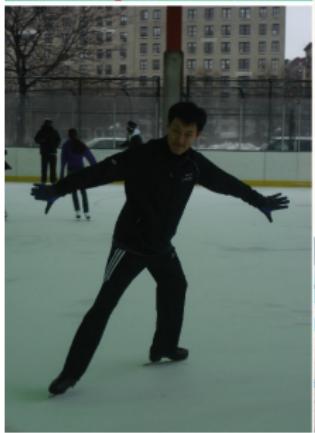
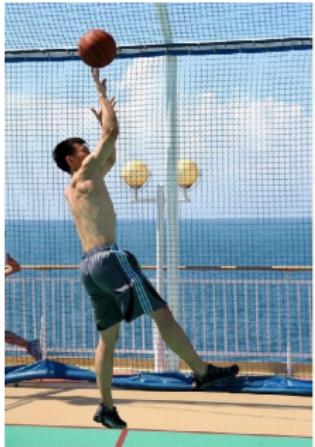
- ▶ Research: oper. research, stochastic modeling, applied prob.
 - ▶ Teaching: stochastic models, probability, etc. (UG and G)



When I'm not teaching or writing papers...

- ▶ **Running**, rock climbing, swimming, basketball, skating, ping pong, badminton, etc.

The Basis of All Is RUNNING!!!



Why Is Running Good
for You

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Why Do Runners Run?

Why Is Running Good
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- ▶ You might as well ask:

“Why do birds fly?” or “Why do fish swim?” or “Why do people buy scratch-off lottery tickets?”

The answer is the same: **Because it's awesome!**

– Mark Remy (editor of RunnersWorld.com)

- ▶ You might also ask:

“Why do guys keep building up?”

or

“Why do girls always talk about
weight loss?”

The answer is the same:

Because it's in their instinct!



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10 Reasons Why Running Is Good for You

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1. Reduce body fat and help you maintain a healthy weight
2. Improve your health in MANY ways
3. Improve athletic level in all activities/sports
4. Increase energy levels so you can work more efficiently
5. Relieve stress, tension, anxiety, and depression
6. Boost self-image and self-esteem. A sense of accomplishment so you feel happy
7. Quality time outdoors; socialize with friends
8. Improve sleeping
9. Increased self-discipline
10. Of course, great-looking legs!
(lean and muscular!)



Running and Weight Loss

跑步与减肥



Why Running Is Best for Weight Loss

Why Is Running Good
for You

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- ▶ **Running works even when you're at rest**

High-intensity exercise like running stimulates more afterburn than low-intensity exercise. **Resting metabolism ↑**

- ▶ **Running is time-efficient**

In the sense of **burning the same amount of calories**, running is more efficient than most sports.

- ▶ **Running is convenient**

- ▶ Little equipment beyond **a pair of running shoes** is required.

- ▶ Comparison (**swim 1 mile ≈ run 4 miles ≈ bike 12 miles**)

- ▶ **Cycling: half body; dangerous outdoor; boring indoor;**

- ▶ **Swimming: full body; technical; hard to push up heart rate.**

- ▶ **Runner's high**

- ▶ Moderate to intense runs produce **endorphins** (morphine-like brain chemicals). (内啡肽)

- ▶ Rule of exercising for weight loss: **if you don't enjoy it, you won't stick with it!**

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Key Strategies for Running to Lose Weight

Why Is Running Good for You

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► Healthy eating is the first step

- You'll only shed pounds if you **burn more than you consume**;
- A common mistake: **overcompensate** for the calories by eating too much.



► Follow a training schedule

- Keep motivated to run regularly (e.g., 3–4 times a week);
- One run builds on another, harder to skip workouts;
- Avoid injury by not increasing mileage too quickly.

► Mix up your running workouts

- Another mistake: **same distance and speed won't help!**
 - You don't feel as hard as it was after a while!
 - Body adjust metabolism to minimize efforts (calories burn)
- Solution: **break the routine!**
 - Mon: 6 mi easy; Tue 3 mi fast; Wed: fast-slow intervals; etc.
 - Trick your body so it keeps high metabolism.

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Formulas of weight and calories

- ▶ Daily basal calories (male $s = +5$ and female $s = -161$)

- ▶ Formula (Mifflin et. al. 1990) 基础代谢公式

$$\left(\frac{10 \times \text{weight}}{1\text{kg}} + \frac{6.25 \times \text{height}}{1\text{cm}} - \frac{5 \times \text{age}}{1\text{year}} + s \right) \frac{\text{cal}}{\text{day}}$$

- ▶ Examples: girl (162cm 60kg) 1300, male (180cm 75kg) 1800

- ▶ Losing 1 lbs \approx burning additional 3500 calories

- ▶ Calories burned by running or walking:

- ▶ Running (speed > 5 mph)

Total calories \approx body weight (lbs) \times 0.75 \times distance (miles)

Example: I run 6 miles = 720 calories

- ▶ Walking (speed 3–4 mph)

Total calories \approx body weight (lbs) \times 0.53 \times distance (miles)

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It's not just about the scale!

- ▶ Body mass index (BMI) = weight (kg) / height² (m²)
 - ▶ Underweight: BMI < 18.5;
 - ▶ Normal: 18.5 < BMI < 25;
 - ▶ Overweight: BMI > 25; (31 for Arnold Schwarzenegger!)
- ▶ Body fat percentage (脂肪比例)

Description	Women	Men
Essential fat	10–13%	2–5%
Athletes	14–20%	6–13%
Fitness	21–24%	14–17%
Average	25–31%	18–24%
Obese	32%+	25%+

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Running and Health

跑步与健康



Running Strengthens Heart and Cardiovascular System

VO₂ max: maximal oxygen uptake (最大摄氧量)

- ▶ “V” - volume, “O₂” - oxygen, “max” - maximum reflects the aerobic physical fitness and endurance capacity
- ▶ Millilitres of oxygen per kilogram of body mass per minute (mL/kg·min)
- ▶ Normal 40–50; world class athlete 80-90

Finite heartbeat hypothesis (有限次心跳 2,500,000,000)

- ▶ Each individual has a limited number of heartbeats
- ▶ Running ↑, heart rate ↓, lifespan ↑
- ▶ My resting heart rate: before 60, after 45



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Running Improves Bone Quality

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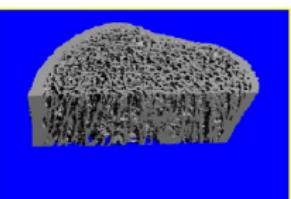
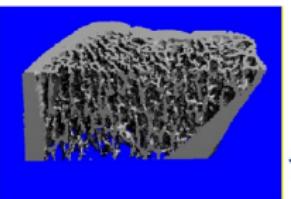
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My bone mineral density (scanned at Columbia medical school)

- ▶ Wrist: < average ☺ perhaps I need to practice boxing!
- ▶ Ankle: > average ☺ because of running!

Running Boosts Immunity

Why Is Running Good for You

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- ▶ Flush bacteria out from lungs (thus decreasing the chance of a cold, flu, or other airborne illness), reduce risk for infection
 - ▶ Flush out cancer-causing cells (carcinogens) by increasing output of wastes, such as urine and sweat.
 - ▶ Circulate antibodies and white blood cells (defense cells) through the body more rapidly, detecting illnesses earlier.
 - ▶ Rise body temperature to prevent bacterial growth, the body fights infections more effectively. (Similar to having a fever.)
 - ▶ Slow down the release of stress-related hormones. (Stress increases the chance of illness.)



And More on Running and Health

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- ▶ Strengthen your heart and cardiovascular system
- ▶ Improve your bone quality (thus lower risk of fracture)
- ▶ Boost your immunity (reduce risk of infection)
- ▶ Improve your circulation and help your body use oxygen better
- ▶ Increase energy levels so you can do more activities without becoming tired or short of breath
- ▶ Lower blood pressure and blood cholesterol
- ▶ Improve muscle tone and strength
- ▶ Improve balance and joint flexibility
- ▶ Relieve stress, tension, anxiety, and depression
- ▶ Improve sleeping
- ▶ Make you look fit and feel happy

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Ready to Start Running?



Choose Your Own Running Shoes

- ▶ Good brands: Adidas, ASICS, New Balance, Saucony, etc.
- ▶ A good website: <http://www.runningwarehouse.com>



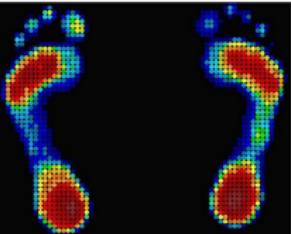
FOOT TYPE (Right Foot)	ASSESSMENT RESULTS	POSSIBLE SHOE TYPE
 Supinated	<ul style="list-style-type: none">• High arch• Ankle has tendency to roll out during balance/dynamic activities• Old shoes are worn on the outside	Cushioned Shoe
 Neutral	<ul style="list-style-type: none">• No exaggeration in foot print• Heel is able to maintain vertical position dynamically• Old shoes are worn between the 1st and 2nd toe	Neutral Shoe
 Pronated	<ul style="list-style-type: none">• Flat arch• Ankle has tendency to roll in during balance/dynamic activities• Old shoes are worn on the inside	Support/Control Shoe

<http://www.aaronswansonpt.com/>

My foot prints
(measured at OMEGA Sports)

<http://www.fleetfeetsports.com/retail/fit-process>

<http://www.runnersworld.com/shoe-finder/shoe-advisor>



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Improve Your Running Forms (Shoes NOT Important!)

Why Is Running Good
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Good forms lead to efficient effort and avoid injuries

- ▶ Posture
 - ▶ Feet straight ahead
 - ▶ Upper body straight and relaxed
 - ▶ Compact arm swings (no crossing the body's center)
- ▶ Landing (protection of your joints: knees and ankles)
 - ▶ Land light (no pounding)
 - ▶ Contact ground **forefoot** first, roll to heel next
 - ▶ Arches absorb shocks
 - ▶ Minimize friction (braking)
 - ▶ Soft on your knees
- ▶ Cadence (步频)
 - ▶ Short and quick strides
 - ▶ Minimize air time (save energy)
 - ▶ Prevent injury
 - ▶ Optimal cadence target: **180/minutes**
- ▶ Leaning forward
 - ▶ Lean from ankles (no bending at waist)
 - ▶ Weight slightly forward
 - ▶ Land under hip line

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#1 POSTURE



- * Feet straight ahead, knees soft.
- * Head level with eyes looking forward.
- * Stretch and reach to the sky, elongating spine.
- * Relax arms to sides at a 90° angle.
- * Keep arms & shoulders relaxed.
- * Use compact arm swings, avoid crossing the body's center line.

#2 FORE-FOOT



- * Contact ground forefoot first.
- * Entire foot lands softly and under hip line.
- * Run light, avoid pounding.
- * Landing on forefoot promotes a balanced running position minimizing friction (braking).

#3 CADENCE



- * Cadence target = 180 steps/min.
- * To find cadence: Jog for 1 min. counting number of times your right foot hits the ground. Goal is 90 foot strikes per foot (180 total).
- * 180 cadence promotes short, quick strides and midfoot strike.

#4 LEAN



- * Lean from the ankles without bending at the waist.
- * Keep weight slightly forward and flex at the ankles.
- * Use gravity to help generate forward momentum.
- * Reset posture, then lean tall into a jog.

COMMON RUNNING FORM



Slouching posture,
heel striking, overstriding
& bending from the waist

lead to inefficient effort and many
common injuries.

VS

GOOD RUNNING FORM



Tall body alignment, forefoot
strike, high cadence
& a forward lean

ensure an easier run, increased
efficiency, and greatly reduce the
chance of injury.

<http://www.goodformrunning.com/>

Link: <http://www.newtonrunning.com/media/wysiwyg/newtonRunnerScript35.swf>

Make Your Own Running Schedule

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Wk	Dat	Mon	Tues	Weds	Thurs	Fri	Sat	Sun	Total
1	4/25 5/1	Easy Run Dist: 2 mi @10:13	Rest /XT	Tempo Run Dist: 5 mi, inc Warm; 3 mi @ 8:39; Cool	Easy Run Dist: 2 mi @10:13	Rest /XT	Long Run Dist: 7 mi @10:13	Rest /XT	16 miles
2	5/2 5/8	Easy Run Dist: 3 mi @10:13	Rest /XT	Speedwork Dist: 5 mi, inc Warm; 2x1600 in 8:10 w/800 jogs; Cool	Easy Run Dist: 3 mi @10:13	Rest /XT	Long Run Dist: 7 mi @10:13	Rest /XT	18 miles
3	5/9 5/15	Easy Run Dist: 3 mi @10:13	Rest /XT	Tempo Run Dist: 5 mi, inc Warm; 3 mi @ 8:39; Cool	Easy Run Dist: 3 mi @10:13	Rest /XT	Long Run Dist: 8 mi @10:13	Rest /XT	19 miles
4	5/16 5/22	Easy Run Dist: 4 mi @10:13	Rest /XT	Tempo Run Dist: 6 mi, inc Warm; 4 mi @ 8:44; Cool	Easy Run Dist: 3 mi @10:13	Rest /XT	Long Run Dist: 8 mi @10:13	Rest /XT	21 miles
5	5/23 5/29	Rest /XT	Easy Run Dist: 3 mi @10:13	Easy Run Dist: 3 mi @10:13	Tempo Run Dist: 5 mi, inc Warm; 3 mi @ 8:39; Cool	Rest /XT	Rest /XT	Race Day Dist: Half- Marathon @8:47 Time: 1:55:20	24 miles

<http://www.runnersworld.com/>

A good plan will help you succeed

- ▶ Be motivated and disciplined
- ▶ Always know how fast to run (avoid injury)
- ▶ Guaranteed progress and success
- ▶ Good plan website: SmartCoach, Active, Advanced Marathon

Then Go Out and Enjoy

Why Is Running Good
for You

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The speed doesn't matter!



OR



doesn't matter!

Just do it and stick to it! You will improve!

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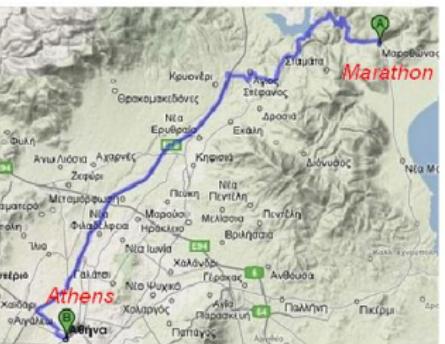
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A Marathon =

- ▶ 26.2 miles' struggle, pain, and suffering;
- ▶ The most miserable way to kill 3 - 7 hours;
- ▶ A lot of sweat and even some blood;
- ▶ **The ultimate challenge of the human body endurance!**

Some history

- ▶ One hero: Pheidippides
- ▶ Two cities: Marathon and Athens



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The World's Top 10 Marathons



1. London, U.K.
2. Berlin, Germany
3. New York City, U.S.
4. Chicago, U.S.
5. Boston, U.S.
6. Stockholm, Sweden
7. Rotterdam, Netherlands
8. Paris, France
9. Honolulu, U.S.
10. Amsterdam, Netherlands

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Question 1: What is the point?

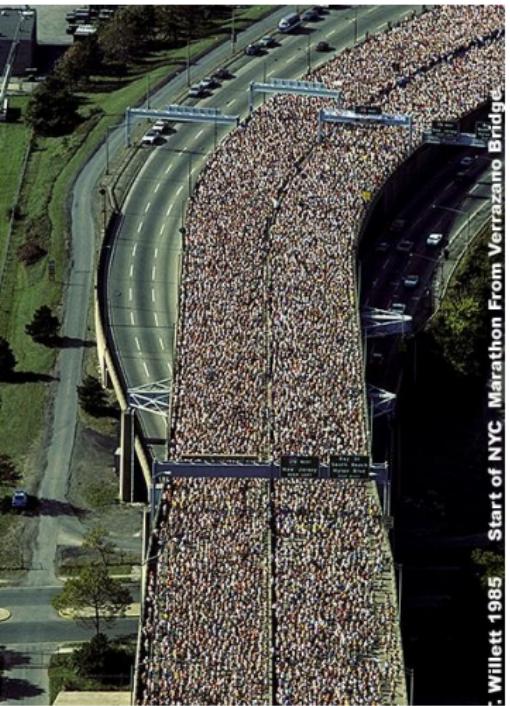
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Trust me: It is WORTHWHILE!



Wilson Kipsang (2:03:23) 2013



NYC marathon 2011

Question 1: What is the point?

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► Sense of accomplishment

- You realize you can do ANYTHING
- Don't let go, use it in every other aspect of your life

► Challenge yourself

- Step out of your comfort zone; explore new things
- Sense of pain (so you cherish the beauty of life better)

► Get fit

- You will be in the best shape of your life
- You will have the strongest mind in your life

► Boost confidence

- Nothing is impossible
- Reminder of what it feels like to not to give up
- That medal on your wall reminds you how badass you are!

► Make new friends (meet strongest and inspirational people)

► Hunger to do better: in your next marathon or other aspect of your life

► Inspire others to try what they thought to be too tough

Question 1: What is the point?

Just go out and join the crowd, you will understand!



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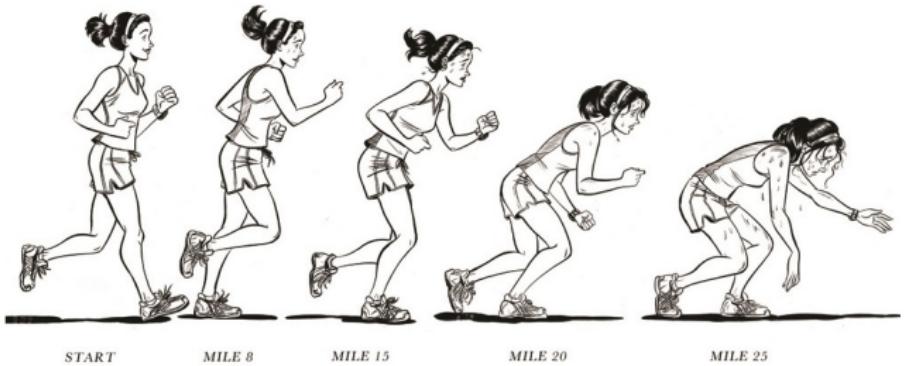
References

Question 2: How Could It Be Possible?

Why Is Running Good
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Yes it is HARD!



START

MILE 8

MILE 15

MILE 20

MILE 25

Combat the triple terrors:

- ▶ Lactic acid accumulation (乳酸积累)
muscle efficiency ↓, fatigue ↑
- ▶ Dehydration (脱水)
blood volume ↓, heart deliver O_2 to muscles ↓
- ▶ Glycogen depletion (肝糖原流失)
fatigue ↑, energy ↓ “hit the wall”

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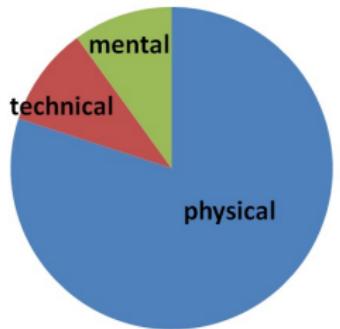
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Yes it is HARD!

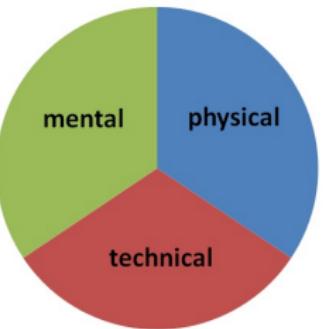
It demands respect:

- ▶ physiological
 - ▶ psychological
 - ▶ technical

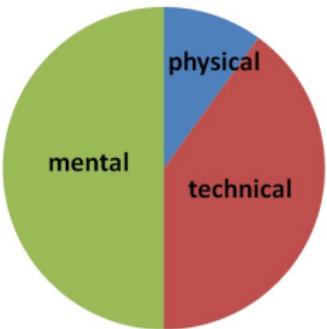
100 meter dash



Marathon



Shooting



Question 2: How Could It Be Possible?

Why Is Running Good for You

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But it is POSSIBLE!

My own experience:

- ▶ Used to run no more than 3 miles in 2009
 - ▶ Now finished 10 marathons (and many half's)
Orlando FL, Long Island NY, New York City NY, Philadelphia PA, Raleigh NC, Cary NC
 - ▶ Improved my time: **4:55** ↘ **3:14**



Bibs (2010)



Medals (2013)

Question 2: How Could It Be Possible?

Why Is Running Good for You

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But it is POSSIBLE!

Do the math:

- ▶ Walk slowly at 3 mph \Rightarrow finish in 9 hours
 - ▶ Walk faster at 4 mph \Rightarrow finish in 6:30

Marathoners around me:

My wife, my colleagues, my Ph.D. advisor and his son, my students, my neighbors, many of my friends..... and maybe some of you?



Question 3: A Terrible Idea to Torture One's Body?!

Why Is Running Good
for You

Yunan Liu

Introduction

Running and Weight
Loss

Why running helps?
Good strategies
Formulas

Running and Health

Improved heart
Strengthened bones
Boosted immunity
And More...

Ready to Get Started?

Choose your shoes
Improve forms
Make schedules
Go out and enjoy

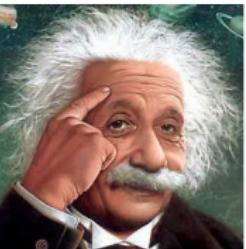
Running A Marathon

What is a marathon?
What is the point?
How is it possible?
Torture of your body?

References

Proper training will NOT harm your body

- ▶ Sufficient training
- ▶ Be patient, not too aggressive
- ▶ Balance training and recovery
- ▶ Wear suitable shoes
- ▶ Run in good form
- ▶ Eat properly
- ▶ Follow a schedule that fits you the best

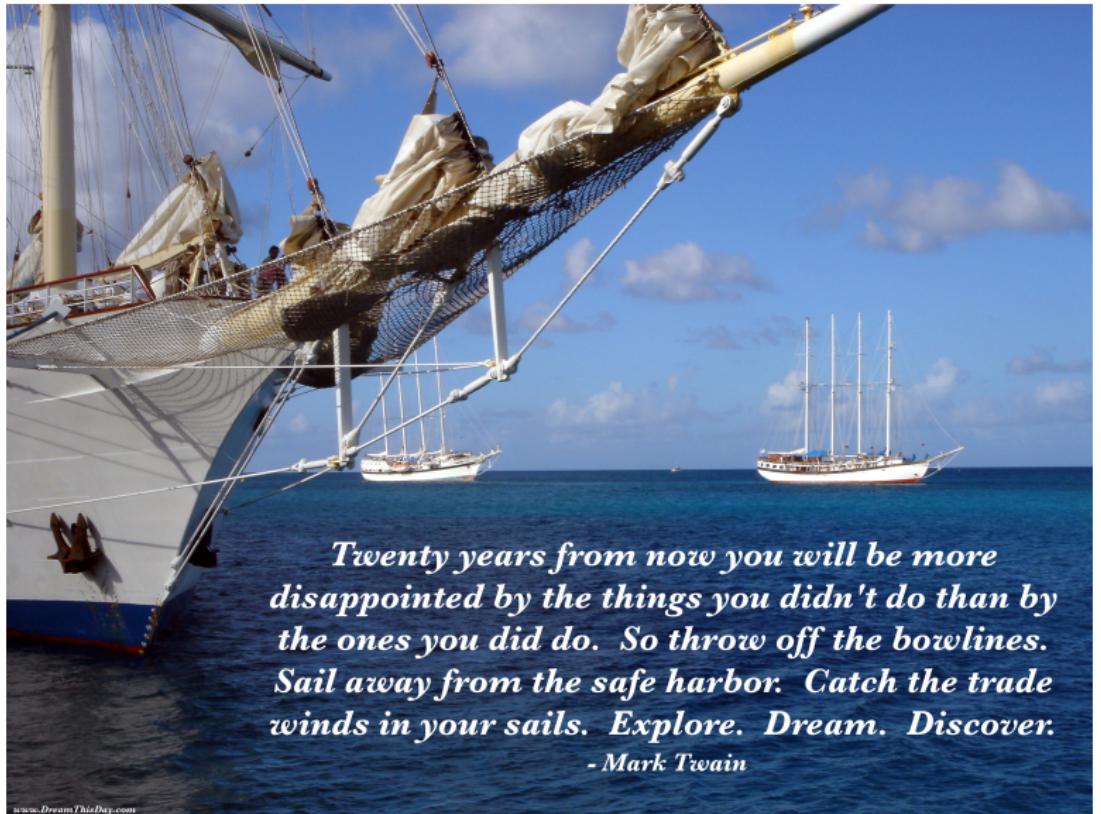


Just be intelligent and thorough, you will be fine!

To Try or Not to Try?

Why Is Running Good for You

Yunan Liu



Twenty years from now you will be more disappointed by the things you didn't do than by the ones you did do. So throw off the bowlines. Sail away from the safe harbor. Catch the trade winds in your sails. Explore. Dream. Discover.

- Mark Twain

www.DreamThisDay.com

Books

- ▶ “Born to Run” by Christopher McDougall
- ▶ “The Runner’s Rule Book: Everything a Runner Needs to Know” by Mark Remy
- ▶ “What I Talk about when I Talk about Running”
by Haruki Murakami
- ▶ “Advanced Marathoning” by Pfitzinger and Douglas

Local Running Clubs

- ▶ nOg Run Club (<http://www.nogrunclub.com/>)
- ▶ North Carolina Roadrunner Club (<http://ncroadrunners.org/>)
- ▶ RTP Chinese Running Club (<http://www.rtprun.com>)

Website

- ▶ Runner’s World (<http://www.runnersworld.com>)

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THANK YOU!

*"At mile 20,
I think I am going to die..."*

*"At mile 22,
I know I am dying..."*

*"At mile 24,
I feel like I am already dead..."*

*"At mile 26.2,
I realize I am too tough to die!"*

