



Training Course Series

Seminar

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Marathon & Health

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Scenes of Marathons

Popular Marathons Around the World

Top Marathons	Total Entries (2012)
1. New York Marathon	46,759* (cancelled in 2012, figures from 2011)
2. Chicago Marathon	37,437
3. London Marathon	36,672
4. Tokyo Marathon	34,678
5. Berlin Marathon	34,377
6. Boston Marathon	22,426 * (27,000 participants defer due to hot weather)

Marathons Hong Kong

Year	Total Entries	Remark
1999	7,000	
2001	10,000	
2006	40,000	1 died, 4,800 cramps, 22 hospitalized
2010	52,368	1,100 cramps, 55 hospitalized
2012	65,000	1 died, 300+ cramps, 38 hospitalized
2013 (24/2)	72,000	

What is Marathon

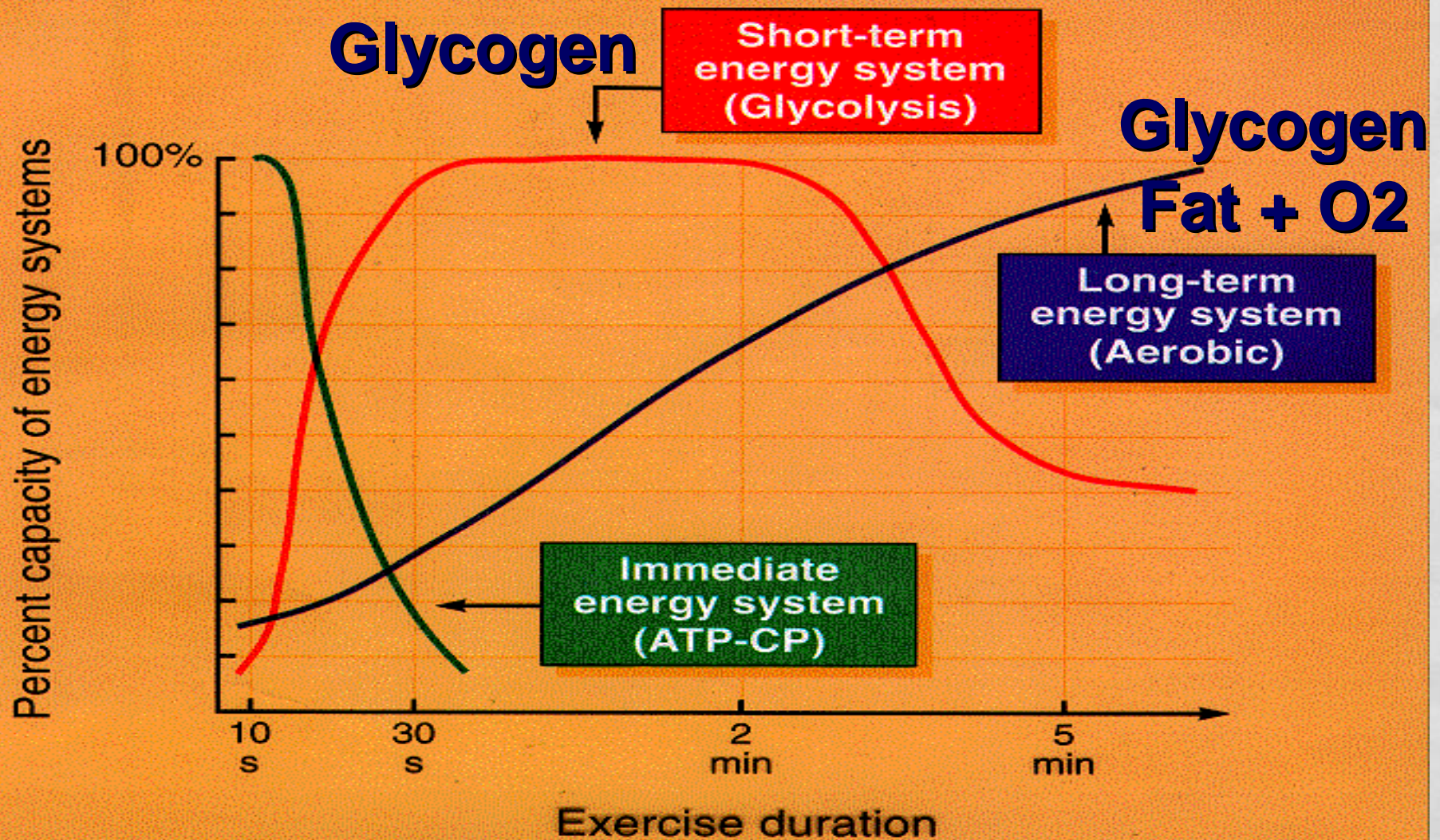
- 42.195 kilometres (26 miles and 385 yards)
- has been an Olympic distance since the modern Olympics started in 1896
- endurance running (ER), the ability to run long distances (>5km) using aerobic metabolism



What is Marathon

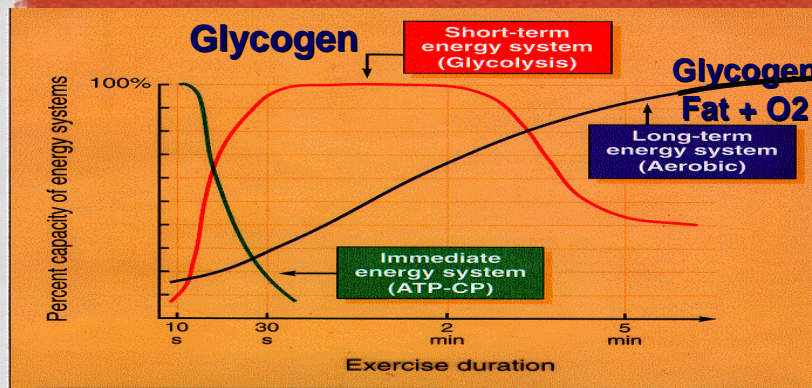
- An aerobic exercise
- Very long distance, repeated, rhythmical, low impact exercise
- Use oxygen, glycogen and body fat as major fuel
- Extreme high demand on heart and lower limb (thigh, knee, calf, ankle)
- Could not achieve without proper training

Energy System of Marathon



Energy System of Marathon

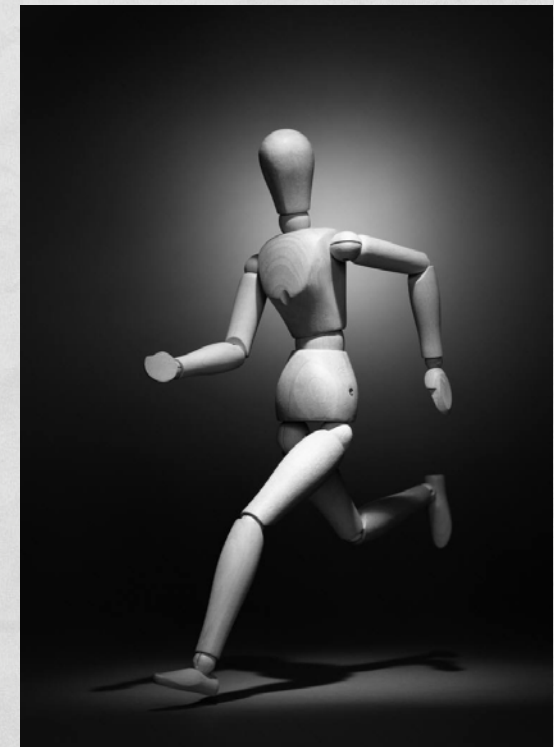
Marathon



Marathon

Running poses more challenges than walking :

- ✓ Muscles involve
- ✓ Impact on joint
- ✓ Stabilization
- ✓ Energy requirement



Athletic Heart

- athletes have bigger and better hearts than the ordinary person
- Two types of athletic hearts (National Heart Institute in Bethesda):
- **endurance hearts** (swimmers and long distance runners, their hearts are bigger)
- **resistance hearts** (wrestlers and shot putters, their hearts are heavier)



Good about Marathon

- Enjoy benefits of long term aerobic ex training
- 50% lower the risk of cardiac mortality
- More vigor and energy
- Lower risk of stroke, diabetes, and hypertension
- Stronger bone density

(American Journal of Clinical Nutrition)



Bad about Marathon

- Even well-trained, risk of cardiac casualty ↑ 7 times during marathon running

(Journal of the American Medical Association)

- However, risk of cardiac casualty for sedentary individuals ↑ 50 times as compared to well-trained individuals

(New England Journal of Medicine)



Endurance Heart

- ◆ endurance training demands a high cardiac output for long periods of time
- ◆ the heart adapts by increased filling
- ◆ In marathoners, the volume at rest may be twice that of the ordinary citizen
- ◆ the heart wall does not thicken, but the entire heart grows larger



Normal “Abnormal” Findings in a Trained Athlete’s Heart

- ◆ slow pulse—rates can go down as far as 28 beats per minute
- ◆ irregular pulse—premature beats and heart block
- ◆ low blood pressure
- ◆ orthostatic hypotension—the blood pressure goes even lower when the athlete stands up
- ◆ heart murmurs due to the force and volume of flow

Normal “Abnormal” Findings in a Trained Athlete’s Heart

- ◆ abnormal EKGs—the Wilt Chamberlain Syndrome where the heart tracings are almost identical to those seen in heart disease
- ◆ elevated blood enzymes—usually seen in heart and liver disease, here the increase is due to muscle breakdown in training
- ◆ enlarged heart on x-ray

Marathon

- ◆ study showed that the energy requirement to complete the Boston marathon in 6 elite runners averaged about 2,410 kcal
- ◆ 10 subjects required about 1,512 kcal to complete a half marathon (21.1 km)



Running a Marathon

Pros	Cons
Strengthen bones and muscles	Damage to the heart
Increase fitness and health	Injuries
More active lifestyle	



Figure 1. Metabolic and Physiological Adaptations to Marathon Running

Benefits



Sources: Hawley & S... 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025

Adapted from: IDEA Fitness Journal Sep2009, Vol. 6 Issue 8, p19 3p

Risks

- Immune System (Immune Dysfunction)
 - Neutrophilia and lymphopenia, including a steep drop in blood natural killer (NK) and T cells
 - Decrease in blood granulocyte oxidative burst activity
 - Decrease in the skin delayed-type hypersensitivity response
 - during this 'open window' of altered immunity (which may last between 3 and 72 hours), viruses and bacteria may gain a foothold, increasing the risk of subclinical and clinical infection
 - overtraining lowers resistance to upper respiratory tract infections such as the common cold and sore throats

Heart Diseases

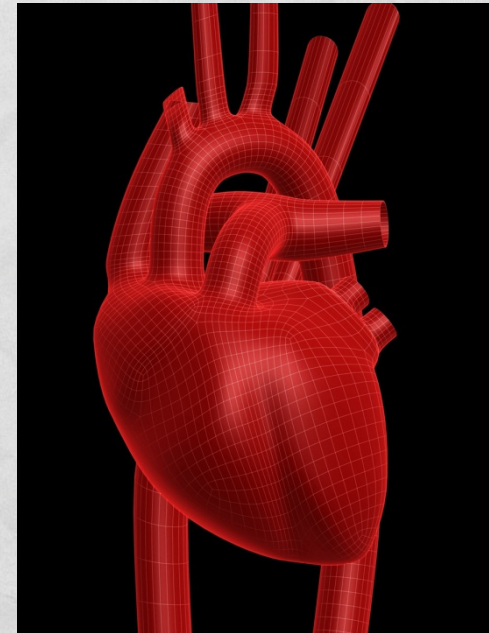
- study of 215,000 runners in the Twin Cities and Marine Corps Marathons revealed four heart-attack deaths, or one per 54,000 participants
- coronary atherosclerosis and sudden cardiac death do occur in marathon runners
- however the incidence of such deaths is in reality low



Webner, D., Duprey, K.M., Drezner, J. A., Cronholm, P., & Roberts, W.O. (2012).
Medicine And Science In Sport And Exercise, 44(10), 1843-1845

Heart Diseases

- 3 factors would seem to be important in predicting those marathon runners at increased risk of developing coronary artery disease:
 - a strong family history of heart disease
 - presence of other coronary risk factors, e.g., an elevated serum cholesterol level or a low HDL: total cholesterol ratio
 - warning symptoms highly suggestive of heart disease



Heart Diseases

- Study suggested that the risk of Sudden Cardiac Arrest (SCA) in US marathons is approximately 1 in 57,000 with the majority occurring in middle- to late-age males
- The risk of SCA was 1 in 57,002, whereas Sudden Cardiac Death (SCD) was 1 in 171,005
- SCA is most common in the late stages of the race, and resuscitation is most successful when there are early responders and an AED is used

Webner, D., Duprey, K.M., Drezner, J. A., Cronholm, P., & Roberts, W.O. (2012).
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Risk of Death Comparison

- *SCD in Marathon* 1 : 171,005
- *Car accident* 1 : 6,535
- *Fall* 1 : 15,614
- *Drown* 1 : 88,772
- *Fire accident* 1 : 90,944
- *Choking* 1 : 334,461
- *Lightening shock* 1 : 6,383,844

(US National Safety Council)

Heart Diseases

- High level of physical fitness do not guarantee the absence of significant cardiovascular disease
- In young athletes, hypertrophic cardiomyopathy may be a more important potential cause of death than ischemic heart disease



Webner, D., Duprey, K.M., Drezner, J. A., Cronholm, P., & Roberts, W.O. (2012).
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Marathon – Good / Bad to Your Heart?

- based on a study done by Athens Medical School, Hippokration Hospital in Athens, Greece
- researchers measured blood pressure and pulse wave velocity (an indicator of arterial stiffness) in 49 men who regularly trained for marathons and 46 subjects who did not
- result showed that both measures were higher in the marathoners
- men who regularly participate in some high-intensity activities—like marathons—tended to experience stiffness in the large arteries

Marathon – Good / Bad to Your Heart?

- based on a study done by Athens Medical School, Hippokration Hospital in Athens, Greece
- Conclusion:
 - exercise may have an inverted U-shape relation with arterial stiffness
 - when you do not exercise, you have higher risk of cardiovascular events, but the same also happens when you exercise too much
 - stiff arteries lead to high blood pressure and can impair the heart
 - aortic stiffness is an indicator of cardiovascular disease and hardening of the arteries, and a predictor of heart attack and related death

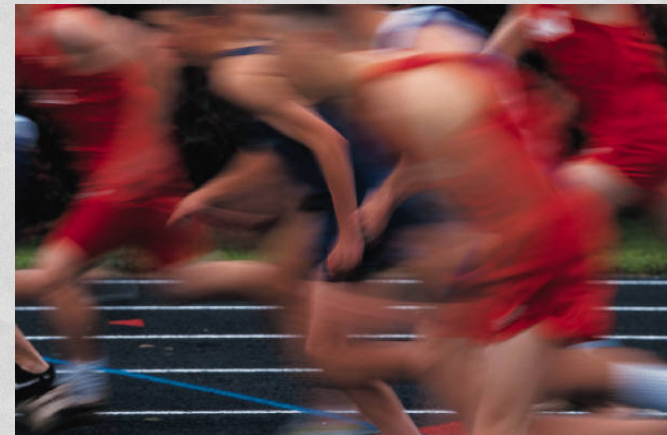
Marathon – Good / Bad??

- sudden death in athletes has been found to be due to some underlying disease not caused by the sport
- the ONLY life-threatening danger to healthy athletes is heat stroke
- Severe prolonged exertion in hot, humid weather can kill the unacclimated dehydrated athlete



Marathon – Good / Bad??

- after all, running a marathon puts the heart through a grueling endurance test that causes temporary damage, even among physically fit marathoners
- the less fit a runner is at race time, the more damage to the left ventricle, the heart's main pumping chamber
- if you plan to run a marathon, protect your heart by starting your training early



Injuries

- Most injuries happen in:
 - Thigh
 - Hamstring
 - Hip
 - Knee
 - Calf
 - Ankle



Injuries

- 1993 Auckland Citibank marathon
 - 526 (60.1%) subjects reported stiffness or pain, or both, in the front thigh
 - 212 (24.2%) subjects reported stiffness or pain, or both, in the hamstring
 - 124 (14.2%) subjects reported stiffness or pain, or both in the hip
 - 224 (25.6%) subjects reported stiffness or pain, or both in the knee

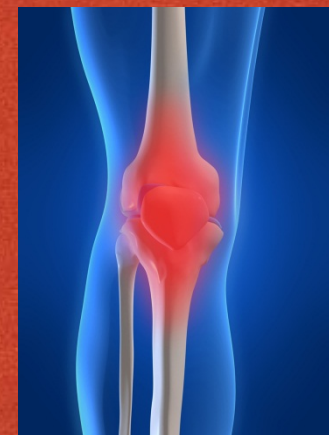
Injuries

- 1993 Auckland Citibank marathon
 - 396 (45.3%) subjects reported stiffness or pain in the calf
 - No significant relations found between body mass index and injury or health problems



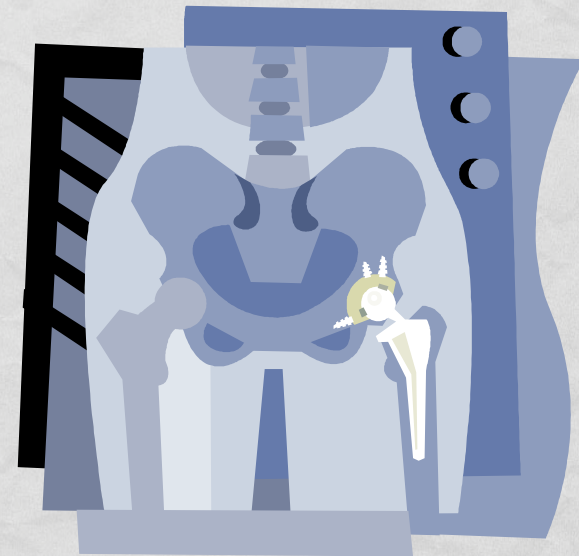
Injuries

- 2005 ING Taipei International Marathon
 - full marathon: thigh pain and ankle/foot discomfort
 - half marathon: hip pain
 - the incidence rate of running injuries was similar between male and female runners
 - a higher rate of knee pain was observed in male subjects



Injuries

- 2005 ING Taipei International Marathon
 - 10 km: more likely to have hip pain
 - The most frequently reported area of pain
 - knee (32.5%)
 - foot/ankle (25.3%)
 - agreeing with previous findings that the knee, foot/ankle sustained higher injury rates than other anatomical locations



Non-elite marathon runners

- Wonderful Copenhagen Marathon 1986
- most non-elite marathon runners were also slim:
 - 7% had a BMI below 20
 - 73% had a BMI within the normal range
 - only 8% having a BMI over 25
- The risk of serious injuries does not seem to be high when training for a marathon
 - only 1.3% of the respondents had injuries preventing them from attending work



Starting a Marathon Training Program

- starting a marathon training program represents a dramatic change in training and puts runners at risk for injury
- sudden changes in training are one of the most frequently mentioned training errors
- the baseline training regimen is less vigorous in those who are relatively inexperienced recreational runners (<1 year of running) who had not previously trained with a training group or completed a marathon

Chorley, J.N., Cianca, J.C., Divine, J.G., & Hew, T.D. (2002)
Clinical Journal of Sport Medicine, 12, 18-23



Starting a Marathon Training Program

- more-experienced runners.
 - had more months of preparation
 - greater baseline running fitness
 - more likely to use training techniques to decrease injury such as stretching, varying speed, and strength training
- training programs to prepare for the marathon seem to appeal more to female athletes and those with less running and marathon experience



Starting a Marathon Training Program

- more than one-half of the participants had never trained for a marathon
- for those that had trained, more than one-half had had at least one unsuccessful attempt
- only 56.4% of the athletes had been training specifically to prepare for the start of the training program
- training techniques that may be associated with injury are more prevalent in those with relatively little running and marathon experience



Training-related Injuries

- based on The Aberdeen Milk Marathon 1982
- of the 287 injured individuals, 71 reported more than one injury
- from a total of 358 injuries, only 20 (6%) did not involve the leg, hip or groin
- the most common site of injury was the knee which accounted for a total of 113 cases (32% of all injuries)
 - most of these injuries (100 out of 113, 88%) were localized to the anterior aspect of the knee
- 98 runners (35%) claimed that performance in race was adversely affected by injury incurred during training

Training-related Injuries

- 36 runners were prevented by injury (all had entered some months before) from competing in this race
- injuries to the calf muscles also appeared to be relatively more common in competition than in training
- knee injuries were again common, and occurred with about the same frequency as during training

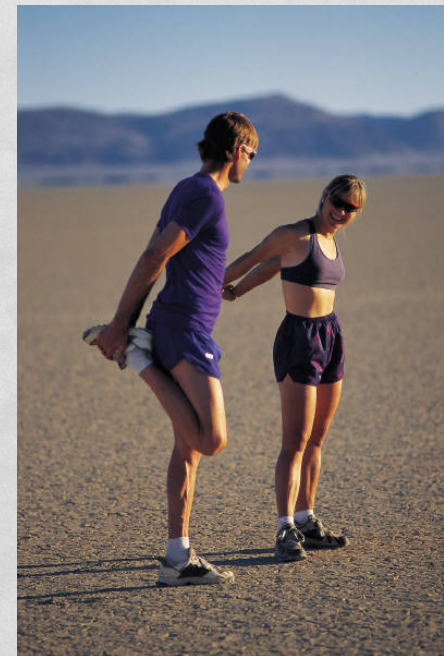


Conclusion

- men are at higher risk of hamstring and calf problems than women
- women are at higher risk of hip problems than men
- increased self reported risks of problems appear to be associated with
 - participation in a marathon for the first time
 - participation in other sports
 - illness in the two weeks before the marathon
 - current use of medication
 - drinking alcohol once a month or more
- Those who had previously not run a marathon were at more than 50% increased risk of injury

Conclusion

- increased training seems to increase the risk of front thigh and hamstring problems, and it may decrease the risk of knee problems
- cross training, stretching, and warm up have been suggested as conferring benefits, including a reduced risk of injury



Conclusion

- although there are many health benefits in marathon running, beginners should be aware that injuries are quite common in marathon runners
- among these are the wear and tear injuries to the skin
- blisters were the most common complaint of marathon runners, with an incidence of 0.2–39%
- beware of:
 - jogger's nipples
 - chafing and abrasions
 - tinea pedis
 - jogger's toe



Get Ready

- ✓ Health Check – PAR-Q / Risk factors
- ✓ Prolonged training
- ✓ Sound nutrition
- ✓ Sufficient rest and recovery

The image features a vibrant red background with a fine, woven texture. A horizontal gold-colored brushstroke, resembling a thick line of paint or a metallic highlight, runs across the upper portion of the frame. Centered in the lower half of the image is the text "Thank You" in a clean, white, sans-serif typeface.

Thank You