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42.195

Joon Bum Kim, MD, PhD

Dept. Thoracic and Cardiovascular Surgery
Asan Medical Center
University of Ulsan College of Medicine

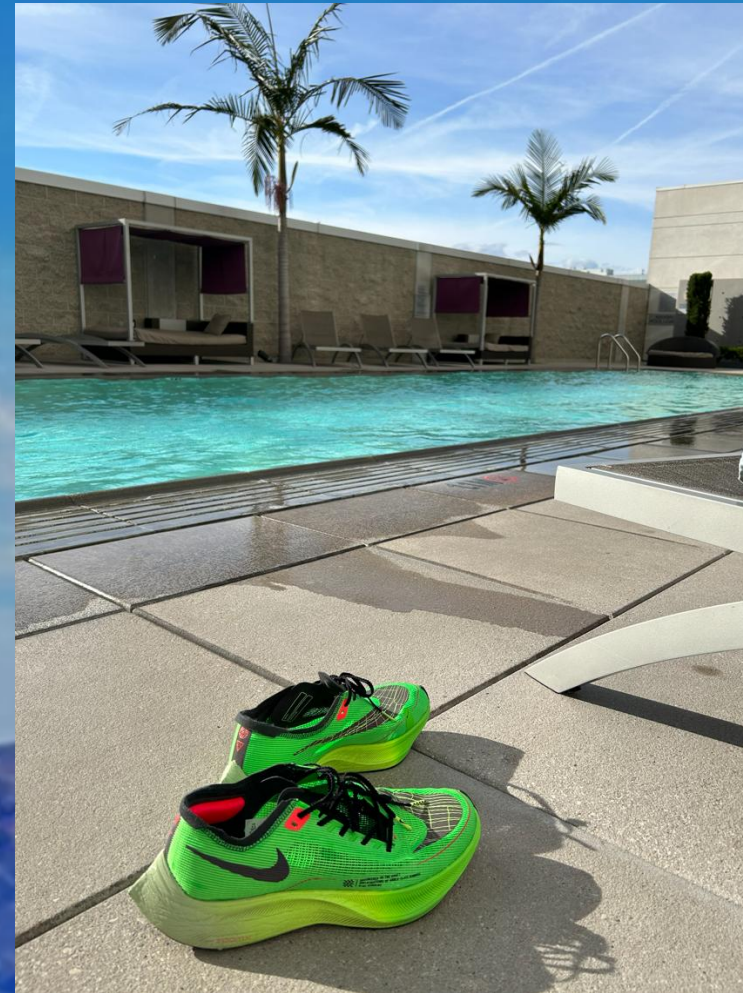


ASAN
Medical Center

Nov 12, 2022



2023 AATS, Los Angeles



<
풀 수영
:

개요
통계
랩
차트
장비

2025년 8월 4일 @ 4:24 오후

풀 수영

메모 추가

400 M
최장 수영

3,000 m
거리

59:50
총 시간

2:00 /100m
평균 페이스

159 bpm
평균 심박수

794
총 칼로리

접영으로 500m 완주하기



심장혈관흉부외과 김준범 교수

수영 경력은

어릴 때부터 물놀이를 좋아했지만 수영을 배워본 적은 없습니다. 초등학교 시절에 수영을 배운 친구들과는 달리 수영을 배우면서 혼나거나 재미없는 동작을 반복한 경험이 없어서 물에서 노는 것을 좋아했던 것 같아요. 지금은 일주일에 3번 정도 수영을 하고, 갈 때마다 자유형 기준 60바퀴(3km) 정도를 돕니다. 주로 자유형, 평형, 접영을 하고 배영은 잘 못합니다(웃음)

최근 연습하고 있는 영법은

자유형은 익숙해지면 마치 걷는 것처럼 그리 힘들이지 않고 할 수 있어요. 금방 1km 넘게 계속할 수 있습니다. 하지만 접영은 운동 강도가 훨씬 세기 때문에 50m 가기도 힘들고, 강한 투지를 발휘해야 간신히 200m를 갈 수 있더라고요. 접영도 자유형 정도의 경지에 도달해보고 싶어서 접영 500m 완주를 목표로 세웠습니다.



어떻게 연습을 하는지

지난해 11월 우리 병원 스포츠센터 조운재 선생님께서 접영을 배우기 시작했습니다. 제가 하던 접영의 모든 것을 다 버리고 새로운 방식, 특히 장거리 접영에 특화된 폼(인터벌을 늘리는 노린 박자)을 익혔습니다. 이전에는 거의 철퍼덕 거리는 수준의 '사람 살려(help me)' 접영이었다면 레슨 후에는 폼이 커지고 온전해지면서 오히려 같은 거리를 가도 몸이 힘들더라고요. 하지만 점차 속도와 거리가 향상됐고 50m씩 거리를 늘려갔습니다. 12월 말 마지막주에 진행된 10번째 수업에서 대망의 500m에 도전했습니다.



김준범 교수(왼쪽)와 조운재 코치.

도전에 성공했는지

명상을 하는 마음으로 몸에 힘을 다 빼고 천천히 접영을 했지만 250m를 지나면서 체력이 급격히 고갈됐습니다. 투지를 발휘해봤지만 400m 지점에서 너무 힘이 들어 포기했어요. 그런데 '오늘 결 못하면 평생 못하겠구나' 하는 생각이 들어서 곧바로 재도전을 했습니다. 동기부여를 위해 조운재 선생님이 직접 옆에서 접영을 함께해 주셨어요. 조금 더 이른 시점에서 체력의 한계를 느꼈던 기개의 발휘 때문인지 우주의 에너지를 흡수한 덕분인지 500m 완주에 성공했습니다! 이 자리에 빌려 조운재 선생님에게 진심 어린 감사의 말씀을 전하고 싶습니다.

First Recorded Running, 2022



4월 29일 (토)





실외 달리기
오후 9:13-오후 9:45

운동 세부사항 >

운동 시간	경과 시간
0:31:58	0:32:03
거리	활동 킬로칼로리
4.43KM	342KCAL
총 킬로칼로리	평균 페이스
342KCAL	7'13"/KM



5월 1일 (월)





실외 달리기
오후 4:59-오후 6:06

운동 세부사항 >

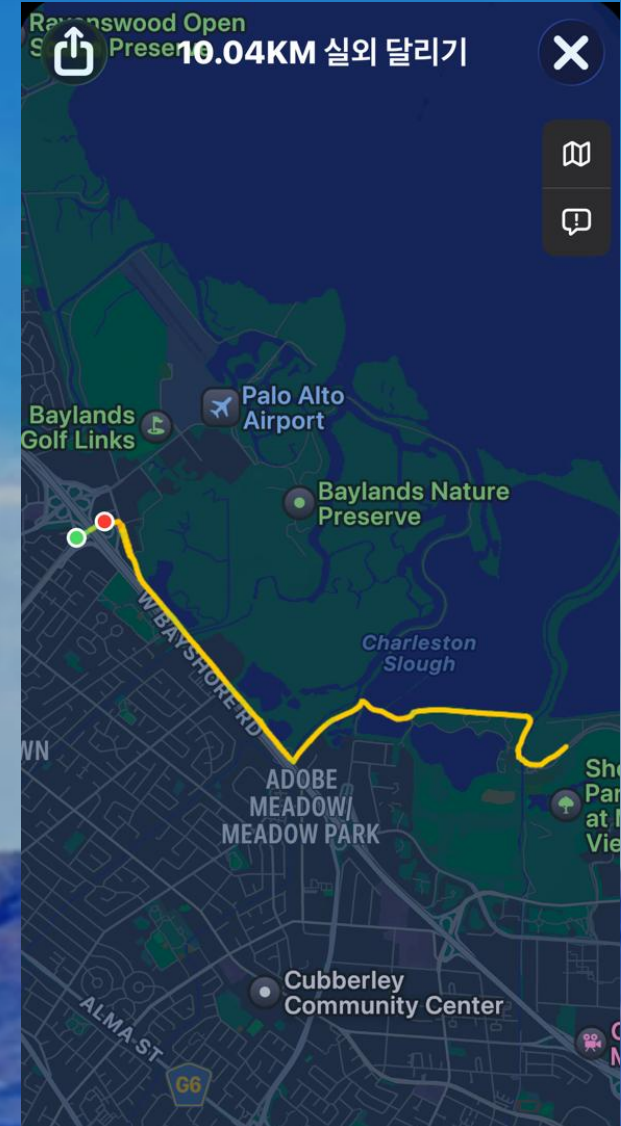
운동 시간	경과 시간
1:06:46	1:07:13
거리	활동 킬로칼로리
10.07KM	798KCAL
총 킬로칼로리	평균 페이스
798KCAL	6'38"/KM

June 2023





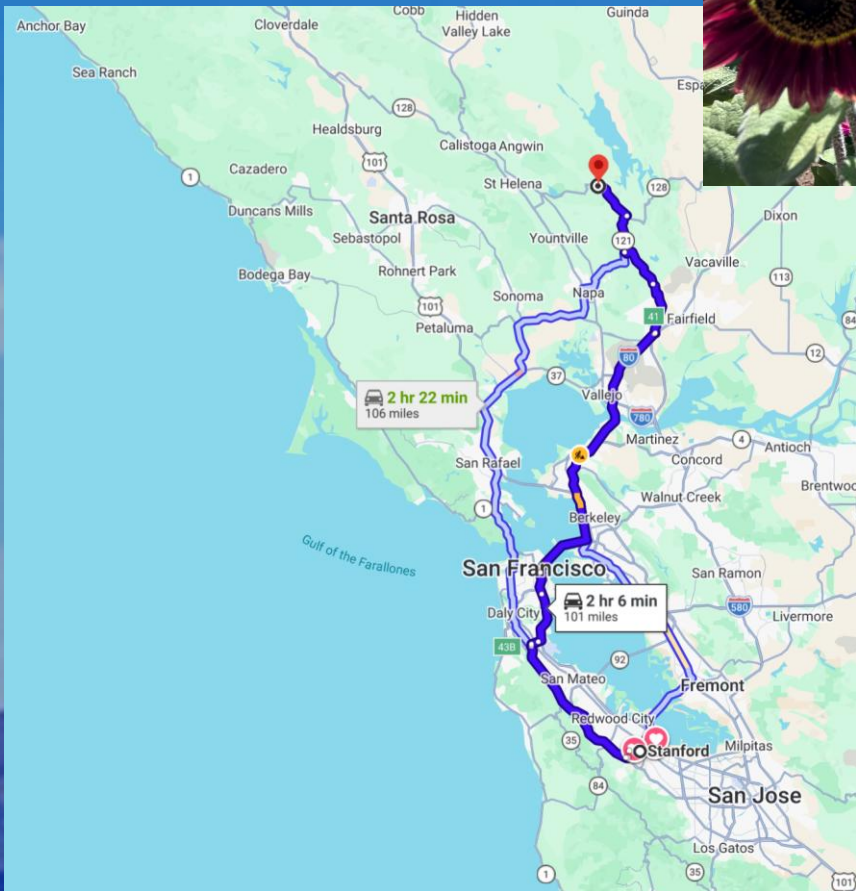
Palo Alto Running





2 Weeks Thereafter







ASAN
Medical Center



2024 KAISER PERMANENTE NAPA VALLEY MARATHON & HALF MARATHON

Sunday, March 3, 2024 at 07:00 AM



2023년 9월

	전체	평균
달리기 시간	15 7:36:07	0:30:24
킬로칼로리	5,873KCAL	391KCAL
거리	73.15KM	4.87KM
페이스		6'14" KM

73.15KM

4.87KM

6'14" KM

2023년 10월

	전체	평균
달리기 시간	26 21:44:10	0:50:09
킬로칼로리	14,658KCAL	563KCAL
거리	211.52KM	8.13KM
페이스		6'10" KM

211.52KM

8.13KM

6'10" KM

2023년 11월

	전체	평균
달리기 시간	22 23:53:00	1:05:08
킬로칼로리	15,958KCAL	725KCAL
거리	234.17KM	10.64KM
페이스		6'07" KM

234.17KM

10.64KM

6'07" KM

Jan 2024





Is long distance running OK on knees?

EDUARD ALENTORN-GELI, MD, MSc, PhD^{1,4} • KRISTIAN SAMUELSSON, MD, MSc, PhD⁵ • VOLKER MUSAHL, MD, PhD⁶
CYNTHIA L. GREEN, PhD⁷ • MOHIT BHANDARI, MD, PhD⁸ • JÓN KARLSSON, MD, PhD⁵

The Association of Recreational and Competitive Running With Hip and Knee Osteoarthritis: A Systematic Review and Meta-analysis

It is well accepted in the scientific and medical community that exercise is good for health. Running for health-related purposes is one of the best exercises to improve cardiovascular, musculoskeletal, respiratory, and general health.¹³ In fact, running is a regular physical activity among millions of persons



around the world. However, is running safe and healthy for weight-bearing joints in all circumstances? Some concerns have been raised about whether prescribing exercise such as running can cause osteoarthritis (OA) in weight-bearing joints, particularly in certain scenarios.⁵⁷ Given the fact that OA may cause severe impairment to the patient's quality of life and require joint replacement, clarification of the influence of running on the development of OA is warranted. This clarification may help determine whether health care providers can safely prescribe running for health-related purposes.

A clear distinction must first be made between running and other sports. It has been observed that the risk of OA may not be equivalent among exercise activities.¹ It has been demonstrated that, in general, previous injury or a heavy occupational workload increases the risk of OA,^{16,49,54} and the level of sports participation (whether elite/professional or recreational) may play an important role in the development of OA in sports.^{8,9,21,29,45} Regarding exposure to running, specifically, there are contradictory data on the risk of OA. Some studies have found that running was not associated with an

• **STUDY DESIGN:** Systematic review and meta-analysis.

• **BACKGROUND:** Running is a healthy and popular activity worldwide, but data regarding its association with osteoarthritis (OA) are conflicting.

• **OBJECTIVES:** To evaluate the association of hip and knee OA with running and to explore the influence of running intensity on this association.

• **METHODS:** PubMed, Embase, and Cochrane Library databases were used to identify studies investigating the occurrence of OA of the hip and/or knee among runners. A meta-analysis of studies comparing this occurrence between runners and controls (sedentary, nonrunning individuals) was conducted. Runners were regarded as "competitive" if they were reported as professional/elite athletes or participated in international competitions. Recreational runners were individuals running in a nonprofessional (amateur) context. The prevalence rate and odds ratio (with 95% confidence interval [CI]) for OA between runners (at competitive and recreational levels) and controls were calculated. Subgroup analyses were conducted for OA location (hip or knee), sex, and years of exposure to running (less or more than 15 years).

• **RESULTS:** Twenty-five studies (n = 125 810 individuals) were included and 17 (n = 114 829

individuals) were meta-analyzed. The overall prevalence of hip and knee OA was 13.3% (95% CI: 11.6%, 15.2%) in competitive runners, 3.5% (95% CI: 3.4%, 3.6%) in recreational runners, and 10.2% (95% CI: 9.9%, 10.6%) in controls. The odds ratio for hip and/or knee OA in competitive runners was higher than that in recreational runners (1.34; 95% CI: 0.97, 1.86 and 0.86; 95% CI: 0.69, 1.07, respectively; controls as reference group; for difference, $P < .001$). Exposure to running of less than 15 years was associated with a lower association with hip and/or knee OA compared with controls (OR = 0.6; 95% CI: 0.49, 0.73).

• **CONCLUSION:** Recreational runners had a lower occurrence of OA compared with competitive runners and controls. These results indicated that a more sedentary lifestyle or long exposure to high-volume and/or high-intensity running are both associated with hip and/or knee OA. However, it was not possible to determine whether these associations were causative or confounded by other risk factors, such as previous injury.

• **LEVEL OF EVIDENCE:** Etiology/harm, level 2a. *J Orthop Sports Phys Ther* 2017;47(6):373-390. doi:10.2519/jospt.2017.137

• **KEY WORDS:** hip, knee, osteoarthritis, runners

[RESEARCH REPORT]

EDUARD ALENTORN-GELL, MD, MSc, PhD^{1*} • KRISTIAN SAMUELSSON, MD, MSc, PhD² • VOLKER MUSAHLE, MD, PhD³
CYNTHIA L. GREEN, PhD⁴ • MOHIT BHANDARI, MD, PhD⁵ • JÖN KARLSSON, MD, PhD⁶

The Association of Recreational and Competitive Running With Hip and Knee Osteoarthritis: A Systematic Review and Meta-analysis

25 studies, n=125,810

Prevalence of hip / knee osteoarthritis:

Recreational runners: 3.5%

Sedentary controls: 10.2%

Elite runners: 13.3%

comparing this occurrence between runners and controls (sedentary, nonrunning individuals) was conducted. Runners were regarded as "competitive" if they were reported as professional/elite athletes or participated in international competitions. Recreational runners were individuals running in a nonprofessional (amateur) context. The prevalence rate and odds ratio (with 95% confidence interval [CI]) for OA between runners (at competitive and recreational levels) and controls were calculated. Subgroup analyses were conducted for OA location (hip or knee), sex, and years of exposure to running (less or more than 15 years).

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between running and knee sports. It has been observed that the risk of OA may not be equivalent among exercise activities.¹ It has been demonstrated that, in general, previous injury or a heavy occupational workload increases the risk of OA,^{2,3,4,5,6,7,8,9} and the level of sports participation (whether elite/professional or recreational) may play an important role in the development of OA in sports.^{3,4,5,6,7,8,9} Regarding exposure to running, specifically, there are contradictory data on the risk of OA. Some studies have found that running was not associated with an

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The Association of Recreational

TABLE 3

COMPARISON OF THE ASSOCIATION BETWEEN OSTEOARTHRITIS AND RUNNING LEVEL

Outcome	Studies, n	Runners, n		Controls, n		Odds Ratio*	I ² , %	P Value
		Events	Total	Events	Total			
Overall population								
Hip and/or knee								<.001
Competitive ^{17,20-22,44,48}	6	184	1382	721	6276	1.34 (0.97, 1.86)	53	
Recreational ^{15-7,19,24,30,34,41,42,55,56}	11	2942	83939	2373	23959	0.86 (0.69, 1.07)	50	
Hip								.36
Competitive ^{17,20-22,48}	5	64	651	188	3067	1.65 (0.94, 2.89)	58	
Recreational ^{41,56}	2	2266	74764	810	14635	0.81 (0.19, 3.42)	48	
Knee								.005
Competitive ^{17,20-22,44,48}	6	120	731	533	3209	1.16 (0.86, 1.57)	15	
Recreational ^{15,7,19,24,30,34,42,55}	8	461	1456	1328	3520	0.83 (0.7, 0.99)	0	

nonprofessional (amateur) context, the prevalence rate and odds ratio (with 95% confidence interval [CI]) for OA between runners (at competitive and recreational levels) and controls were calculated. Subgroup analyses were conducted for OA location (hip or knee), sex, and years of exposure to running (less or more than 25 years).

• **RESULTS:** Twenty-five studies (n = 125,830 individuals) were included and 17 (n = 134,829

both associated with hip and/or knee OA. However, it was not possible to determine whether these associations were causative or confounded by other risk factors, such as previous injury.

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OA,^{18-20,22} and the level of sports participation (whether elite/professional or recreational) may play an important role in the development of OA in sports.^{5,6,19,20,40}

Regarding exposure to running, specifically, there are contradictory data on the risk of OA. Some studies have found that running was not associated with an



The Influence of Running on Lower Limb Cartilage: A Systematic Review and Meta-analysis

Michaela C. M. Khan^{1,2}  · James O'Donovan^{3,4,5} · Jesse M. Charlton^{1,2}  · Jean-Sébastien Roy^{6,7}  ·
Michael A. Hunt^{1,2}  · Jean-Francois Esculier^{1,2,8} 

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A systematic review / meta-analysis of MRI cartilage study

43 Articles

thickness, as well as T1ρ and T2 relaxation times immediately; however, these changes did not persist. Meta-analyses revealed a small and moderate decrease immediately following a single running bout in T2 relaxation time in the medial femur and tibia, respectively. Qualitative analyses indicated that the influence of repeated exposure to running on cartilage morphology and composition was limited. Despite conflicting evidence regarding pre-existing knee cartilage lesions, moderate evidence suggests that running does not lead to the formation of new lesions. Repeated running exposure did not cause changes to foot and ankle cartilage thickness or composition.

Conclusions Changes to lower limb cartilage following running are transient. Immediate changes to cartilage morphology and composition, which likely reflect natural fluid dynamics, do not persist and were generally not significant when pooled statistically. Results suggest that cartilage recovers well from a single running bout and adapts to repeated exposure. Given that moderate evidence indicates that running does not lead to new lesions, future trials should focus on clinical populations, such as those with osteoarthritis.

Trial Registration Not applicable.



The Influence of Running on Lower Limb Cartilage: A Systematic Review and Meta-analysis

Michaela C. M. Khan^{1,2} · James O'Donovan^{3,4,5} · Jesse M. Charlton^{1,2} · Jean-Sébastien Roy^{6,7} · Michael A. Hunt^{1,2} · Jean-Francois Esculier^{1,2,8}

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- ✓ Short-term cartilage volume/thickness changes are minimal and transient.
- ✓ Cartilage composition returns to baseline with rest, even during ultramarathons.
- ✓ Running for ~10 years does not produce new cartilage lesions

to provide recommendations to sports medicine practitioners and runners.

Objective Our aim was to summarize the influence of running on lower limb cartilage morphology and composition using magnetic resonance imaging (MRI).

Methods We searched for relevant studies in the following databases: PubMed, Embase, CINAHL, SportDiscus, Web of Science, and Cochrane Central Registry of Controlled Trials. Qualitative analyses considered the number and methodological quality ratings of studies based on the *QualSys* tool, and recommendations were based on the strength of evidence (strong, moderate, limited, or very limited). Quantitative

Results We included 47 articles, assessing seven outcomes (lesions, volume, thickness, glycosaminoglycan content, and T1ρ, T2, and T2* relaxation times). Nineteen articles were rated as high quality, 24 were rated as moderate quality, and none were rated as low quality. Qualitative analyses suggest that running may cause an immediate reduction in knee cartilage volume,

thickness, as well as T1ρ and T2 relaxation times immediately; however, these changes did not persist. Meta-analyses revealed a small and moderate decrease immediately following a single running bout in T2 relaxation time in the medial femur and tibia, respectively. Qualitative analyses indicated that the influence of repeated exposure to running on cartilage morphology and composition was limited. Despite conflicting evidence regarding pre-existing knee cartilage lesions, moderate evidence suggests that running does not lead to the formation of new lesions. Repeated running exposure did not cause changes to foot and ankle cartilage thickness or composition.

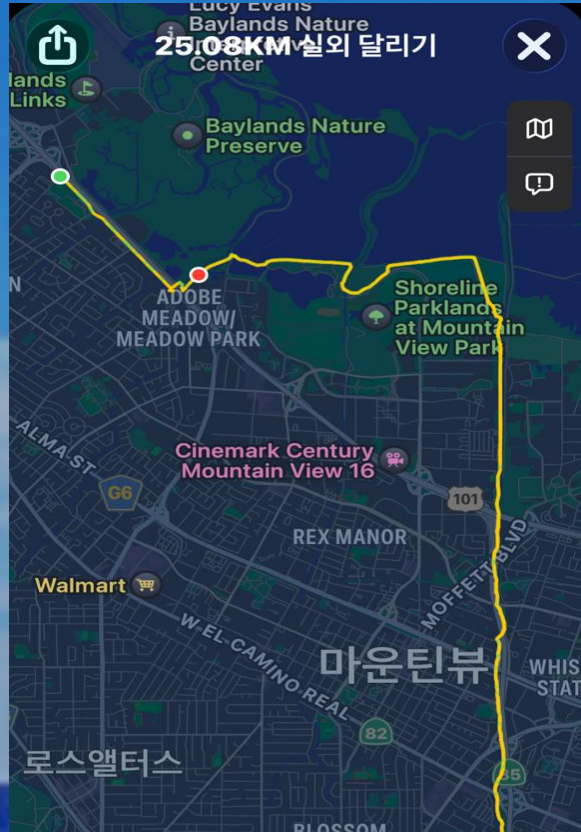
Conclusions Changes to lower limb cartilage following running are transient. Immediate changes to cartilage morphology and composition, which likely reflect natural fluid dynamics, do not persist and were generally not significant when pooled statistically. Results suggest that cartilage recovers well from a single running bout and adapts to repeated exposure. Given that moderate evidence indicates that running does not lead to new lesions, future trials should focus on clinical populations, such as those with osteoarthritis.

Trial Registration Not applicable.



Pre-Marathon Progress

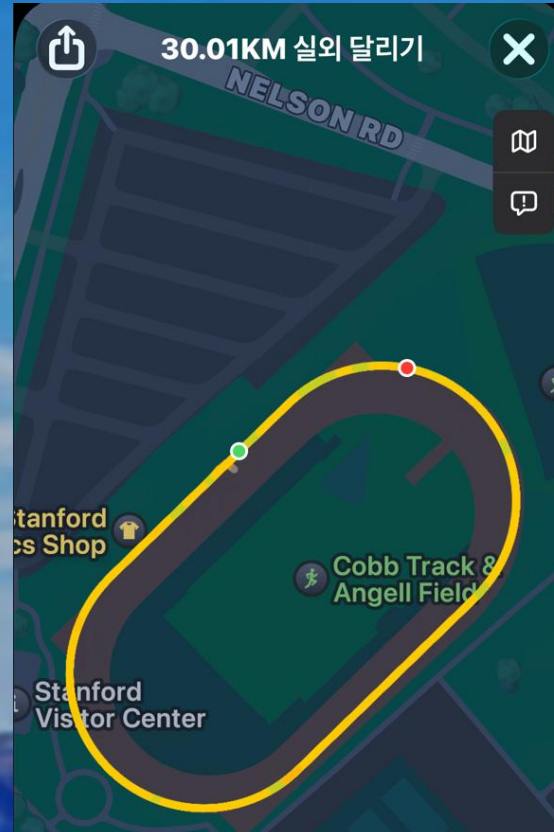
11/4



평균 페이스
6'31"/KM

평균 심박수
150BPM

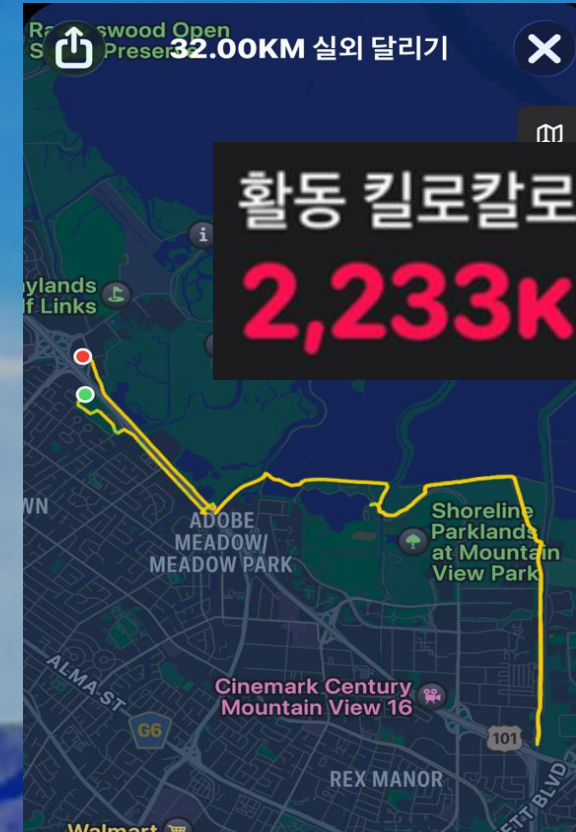
12/11



평균 페이스
6'19"/KM

평균 심박수
157BPM

2/17



활동 킬로칼로리
2,233KCAL

평균 페이스
6'04"/KM

평균 심박수
157BPM



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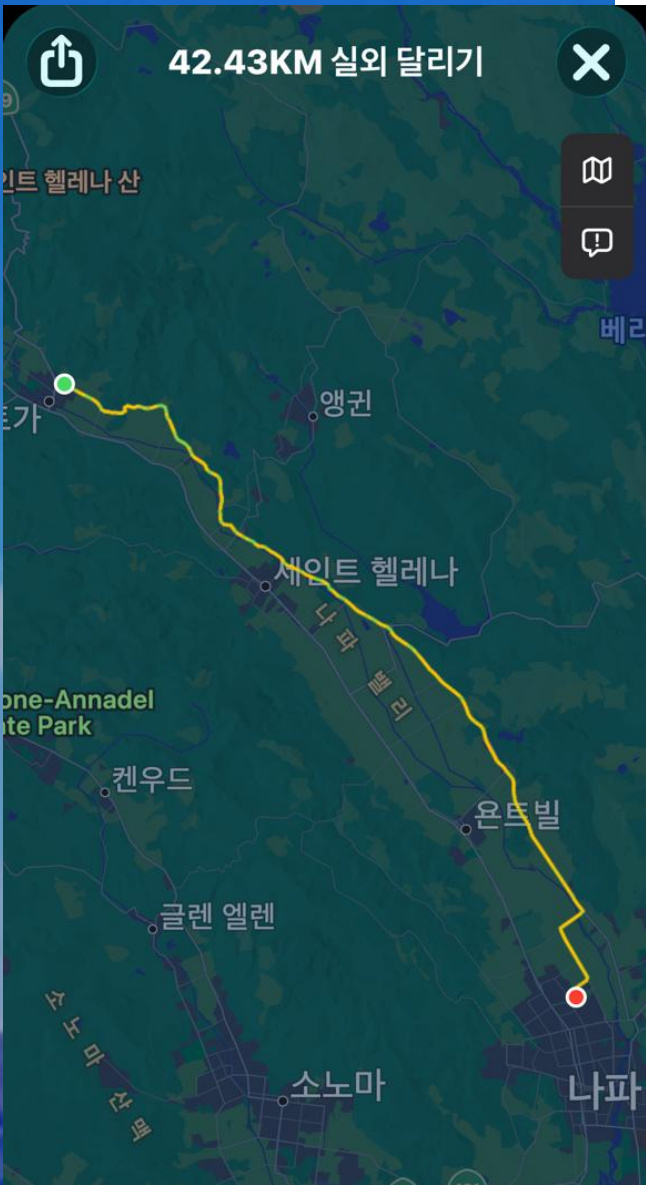
Napa Valley, March 3





Napa Valley, March 3





NVM KAISER PERMANENTE
NAPA VALLEY
MARATHON
AND HALF MARATHON

JOONBUM KIM

CONGRATULATIONS ON COMPLETING THE MARATHON

03:59:58
NET TIME

09:09
AVERAGE PACE

576 OVERALL RANKING
383 GENDER RANKING

Is long distance running OK on CV and Health?

Training for a First-Time Marathon Reverses Age-Related Aortic Stiffening



Anish N. Bhuva, MBBS,^{a,b} Andrew D'Silva, MBBS,^c Camilla Torlasco, MD,^{b,d} Siana Jones, PhD,^a Niromila Nadarajan, MBBS,^a Jet Van Zalen, MSc,^b Nish Chaturvedi, PhD,^a Guy Lloyd, MD,^b Sanjay Sharma, MD,^c James C. Moon, MD,^{a,b} Alun D. Hughes, PhD,^a Charlotte H. Manisty, MD^{a,b}

ABSTRACT

BACKGROUND Aging increases aortic stiffness, contributing to cardiovascular risk even in healthy individuals. Aortic stiffness is reduced through supervised training programs, but these are not easily generalizable.

OBJECTIVES The purpose of this study was to determine whether real-world exercise training for a first-time marathon can reverse age-related aortic stiffening.

METHODS Untrained healthy individuals underwent 6 months of training for the London Marathon. Assessment pre-training and 2 weeks post-marathon included central (aortic) blood pressure and aortic stiffness using cardiovascular magnetic resonance distensibility. Biological "aortic age" was calculated from the baseline chronological age-stiffness relationship. Change in stiffness was assessed at the ascending (Ao-A) and descending aorta at the pulmonary artery bifurcation (Ao-P) and diaphragm (Ao-D). Data are mean changes (95% confidence intervals [CIs]).

RESULTS A total of 138 first-time marathon completers (age 21 to 69 years, 49% male) were assessed, with an estimated training schedule of 6 to 13 miles/week. At baseline, a decade of chronological aging correlated with a decrease in Ao-A, Ao-P, and Ao-D distensibility by 2.3, 1.9, and 3.1×10^{-3} mm Hg⁻¹, respectively ($p < 0.05$ for all). Training decreased systolic and diastolic central (aortic) blood pressure by 4 mm Hg (95% CI: 2.8 to 5.5 mm Hg) and 3 mm Hg (95% CI: 1.6 to 3.5 mm Hg). Descending aortic distensibility increased (Ao-P: 9%; $p = 0.009$; Ao-D: 16%; $p = 0.002$), while remaining unchanged in the Ao-A. These translated to a reduction in "aortic age" by 3.9 years (95% CI: 1.1 to 7.6 years) and 4.0 years (95% CI: 1.7 to 8.0 years) (Ao-P and Ao-D, respectively). Benefit was greater in older, male participants with slower running times ($p < 0.05$ for all).

CONCLUSIONS Training for and completing a marathon even at relatively low exercise intensity reduces central blood pressure and aortic stiffness—equivalent to a ~4-year reduction in vascular age. Greater rejuvenation was observed in older, slower individuals. (J Am Coll Cardiol 2020;75:60-71) © 2020 by the American College of Cardiology Foundation.

Training for a First-Time Marathon Reverses Age-Related Aortic Stiffening



Anish N. Bhurva, MBBS,^{1,2} Andrew D'Silva, MBBS,¹ Camilla Tortolero, MD,^{1,2} Siana Jones, PhD,¹
 Nirumala Nadarajan, MBBS,¹ Jet Van Zalen, MSc,¹ Nish Chaturvedi, PhD,¹ Guy Lloyd, MD,¹ Sanjay Sharma, MD,¹
 James C. Moon, MD,^{1,2} Alun D. Hughes, PhD,¹ Charlotte H. Manisty, MD^{1,2}

ABSTRACT

BACKGROUND

Age-related aortic stiffness is reduced by

OBJECTIVES

The purpose of this study was to determine if

METHODS

Untrained individuals underwent 2 weeks of pre-training and 2 weeks of post-training. Aortic stiffness was measured by magnetic resonance imaging. The relationship between aortic stiffness and age was determined. Change in aortic stiffness was determined. Change in aortic stiffness was determined.

RESULTS

A total of 100 participants completed the study. The estimated training schedule was 100 km. Training decreased aortic stiffness by 3 mm Hg (95% CI: 1.6 to 4.4; p = 0.002), while remaining stable in older participants (1.1 to 7.6 years) and 4 participants with slower training.

CONCLUSIONS

Training for a first-time marathon reverses age-related aortic stiffness—equivalent to a ~4-year reduction in vascular age. Greater rejuvenation was observed in older, slower individuals. (J Am Coll Cardiol 2020;75:60–71) © 2020 by the American College of Cardiology Foundation.



Training for a First-Time Marathon Reverses Age-Related Aortic Stiffening



Julius M. Wernke, MD, PhD, Andrew J. Wernke, MD, PhD, Timothy J. Wernke, MD, PhD, et al.

Shivendu Nadarajan, MD, PhD, Jie Yan Zhai, MD, PhD, Nick Chelvanathan, PhD, Guy Lloyd, MD, Sander Sharma, MD, PhD

138 first-time marathon completers
(age 21 to 69 years)

ABSTRACT

BACKGROUND Aging increases aortic stiffness, contributing to cardiovascular risk even in healthy individuals. Aortic stiffness is reduced through supervised training programs, but these are not easily generalizable.

OBJECTIVES The purpose of this study was to determine whether supervised training for a first-time marathon

METHODS Untrained healthy individuals underwent 6 months of training for the London Marathon. Assessment pre-training and 2 weeks post-marathon included central (aortic) blood pressure and aortic stiffness using cardiovascular magnetic resonance distensibility. Biological “aortic age” was calculated from the baseline chronological age-stiffness

Pre-training & 2 weeks post-marathon tests

- ✓ **Aortic (!!!) blood pressure**
- ✓ aortic stiffness using **CV MRI distensibility**

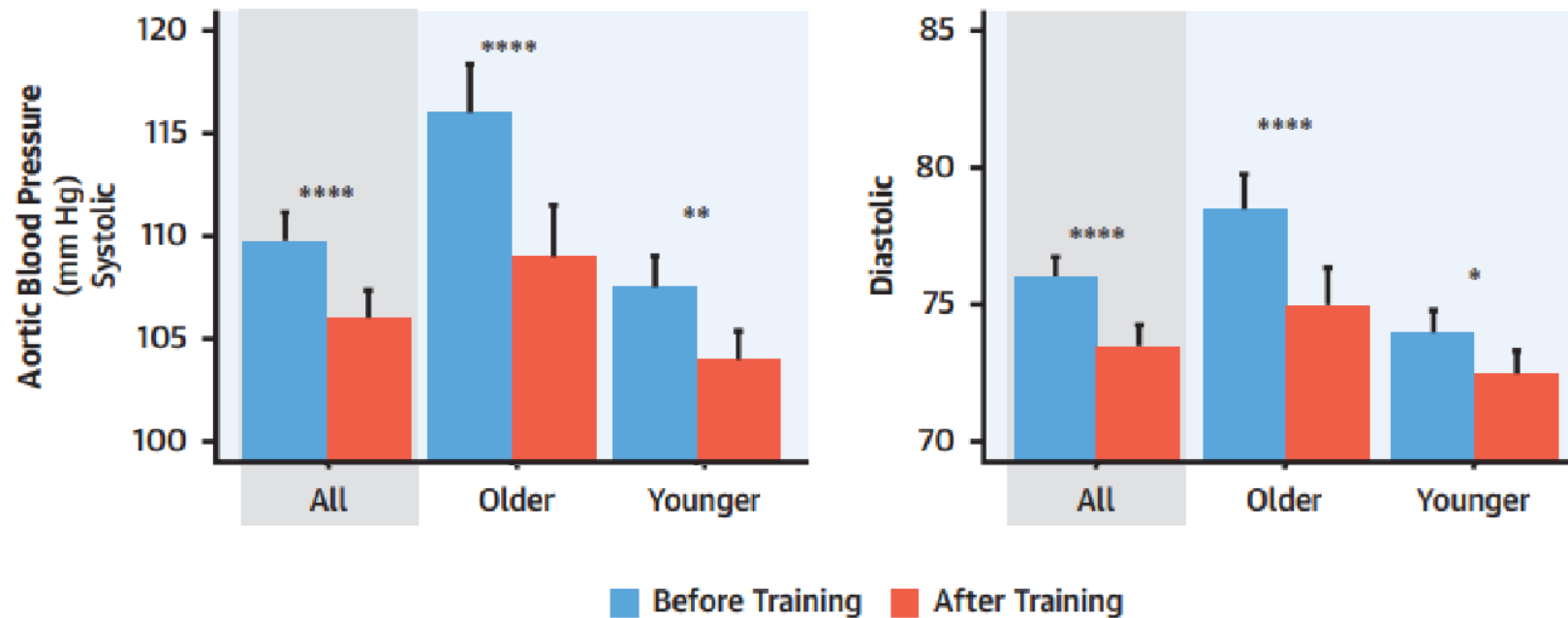
relationship. The primary endpoint was the change in biological “aortic age” after 6 months of training.

Results: 138 first-time marathon completers (mean age 40.5 ± 10.5 years, range 21 to 69 years) completed the study. Central blood pressure (CBP) decreased from 115 ± 10 mmHg to 105 ± 10 mmHg (p < 0.001), while remaining unchanged in the Ao-A. These translated to a reduction in “aortic age” by 3.9 years (95% CI: 1.1 to 7.6 years) and 4.0 years (95% CI: 1.7 to 6.3 years) (Ao-P and Ao-D, respectively). Benefit was greater in older, male participants with slower running times (p < 0.05 for all).

CONCLUSIONS Training for and completing a marathon even at relatively low exercise intensity reduces central blood pressure and aortic stiffness—equivalent to a ~4-year reduction in vascular age. Greater rejuvenation was observed in older, slower individuals. (J Am Coll Cardiol 2020;75:60–71) © 2020 by the American College of Cardiology Foundation.



FIGURE 2 Greater Change With Exercise Training in Aortic Blood Pressure and Distensibility Is in Older Age Category Participants (Age >37 Years)



CONCLUSIONS Training for and completing a marathon even at relatively low exercise intensity reduces central blood pressure and aortic stiffness—equivalent to a ~4-year reduction in vascular age. Greater rejuvenation was observed in older, slower individuals. (J Am Coll Cardiol 2020;75:60–71) © 2020 by the American College of Cardiology Foundation.

Training for a First-Time Marathon Reverses Age-Related Aortic Stiffening

FIGURE 3 Baseline Central (Aortic) Systolic Blood Pressure, Aortic Stiffness,

ABSTRACT

BACKGROUND Age-related stiffness is reduced by

OBJECTIVES The purpose of this study was to determine whether a 12-week, low-intensity, supervised walking program can reverse age-related changes in gait.

METHODS Untrained pre-training and 2 weeks of magnetic resonance (1.5T) relationship. Change in bifurcation (Ao-P) and

RESULTS A total of estimated training w decreased in Ao-A, Ao Training decreased to 3 mm Hg (95% CI: 1, $p = 0.002$), while re 1.1 to 7.6 years) and 4 participants with slo

CONCLUSIONS The pressure and aortic stiffer, slower individuals.

FIGURE 3 Baseline Central (Aortic) Systolic Blood Pressure, Aortic Stiffness, and Estimated Aortic Age

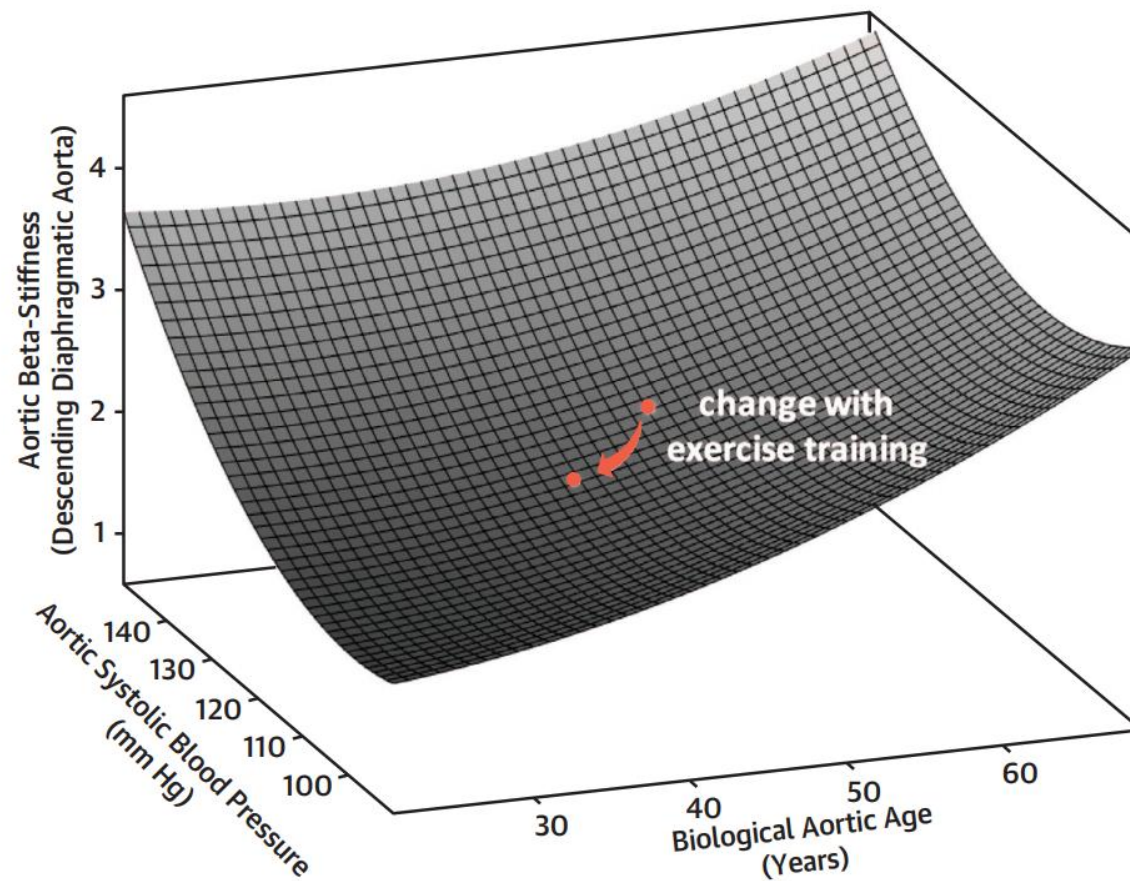
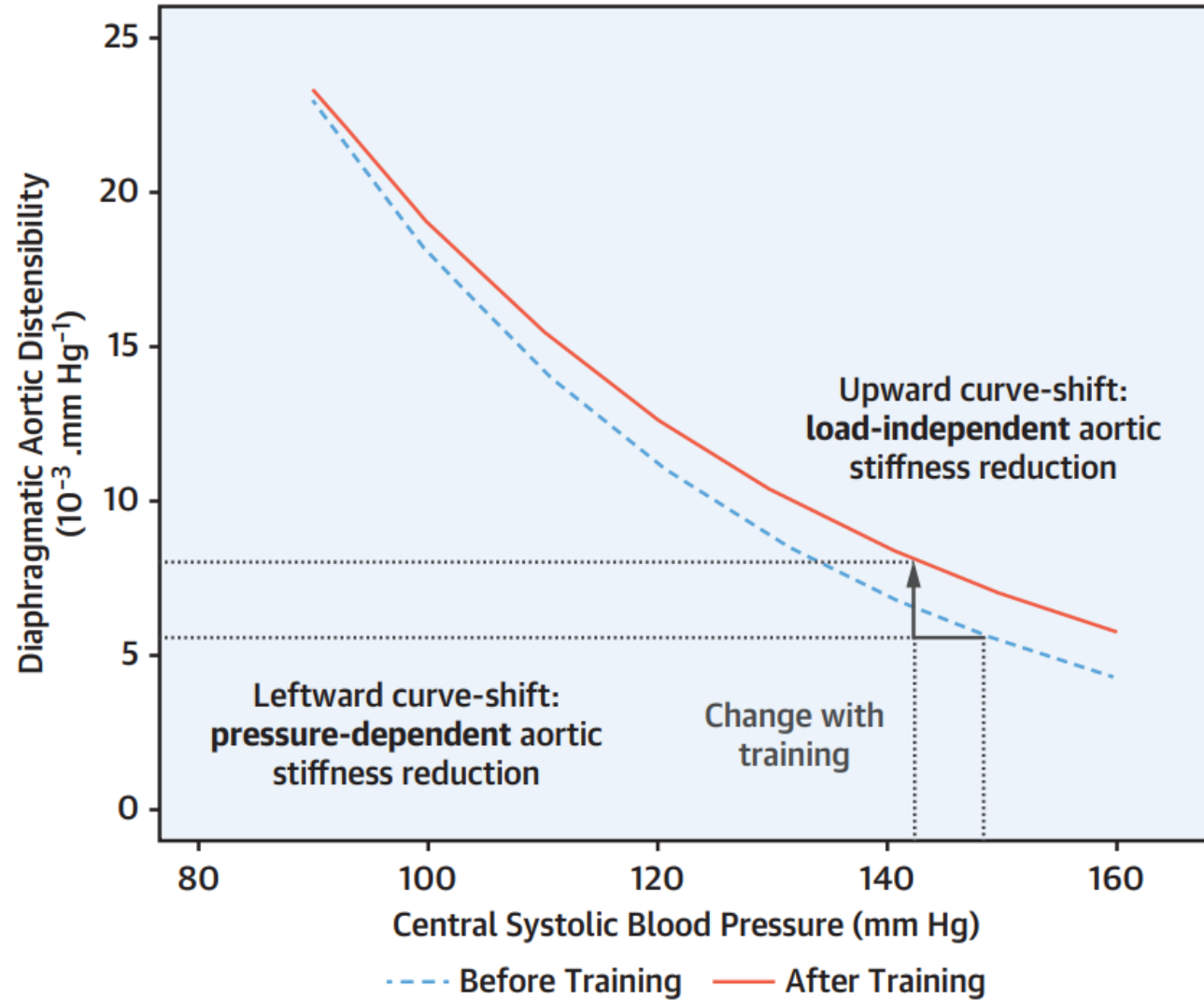


FIGURE 4 Reduction in Aortic Stiffness With Exercise Stiffness Is Due to Both Intrinsic Structural (Load-Independent) and Functional (Pressure-Dependent) Changes



Training Reverses

Anish N. Bhurva, MBBS,
Nirmita Nadarajan, MD,
James C. Moon, MD,^{1,2}

ABSTRACT

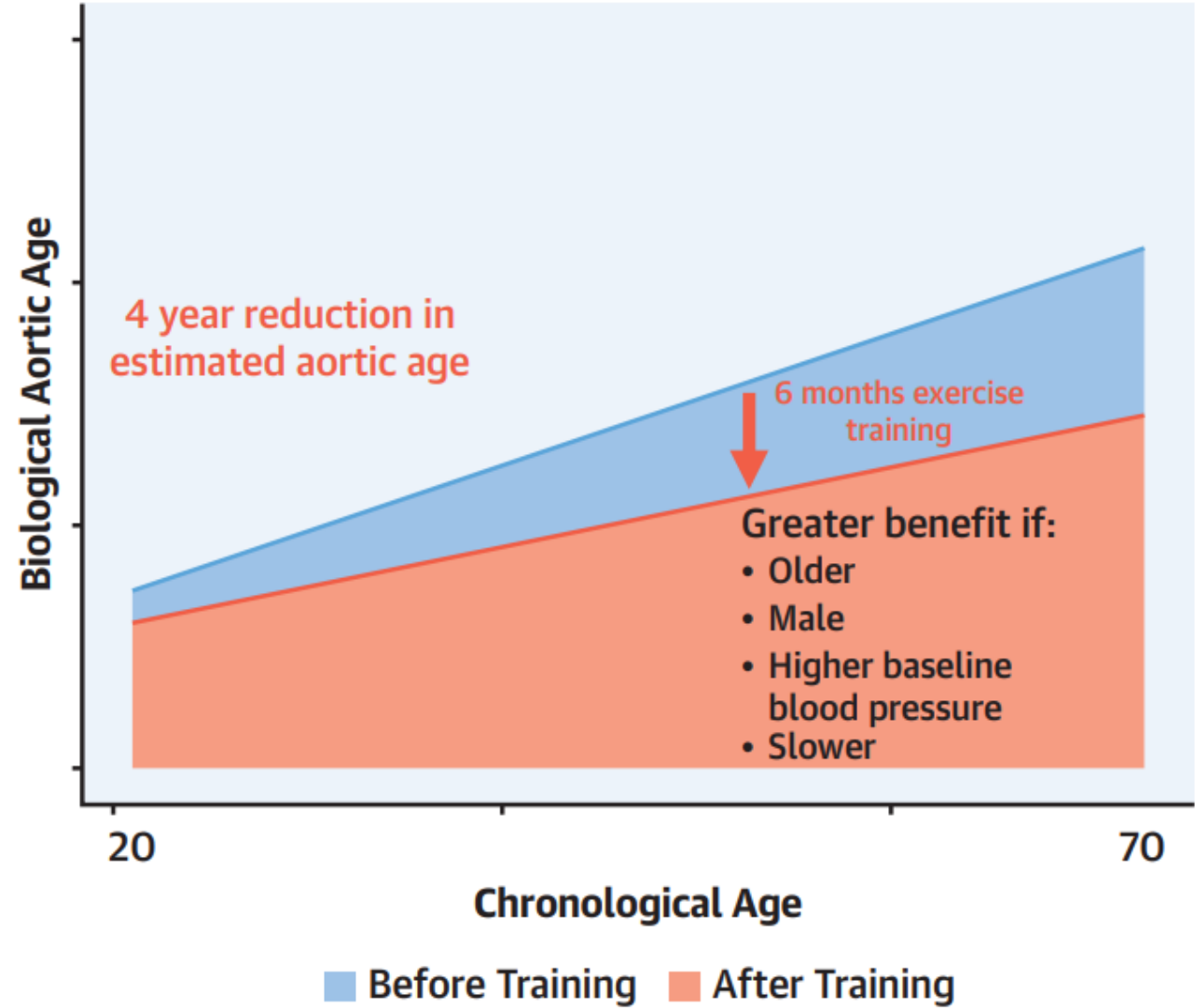
BACKGROUND Aging stiffness is reduced the

OBJECTIVES The purpose of this study was to determine if exercise training can reverse age-related

METHODS Untrained pre-training and 2 week magnetic resonance displacement relationship. Change in bifurcation (Ao-P) and

RESULTS A total of 10 participants completed the estimated training schedule. Training decreased systolic blood pressure (95% CI: 1.6 to 3.2 mm Hg, $p = 0.002$), while remaining stable (1.1 to 7.6 years) and 4.0 participants with slower

CONCLUSIONS Training decreased blood pressure and aortic stiffness in older, slower individuals.



Training for a First-Time Marathon Reverses Age-Related Aortic Stiffening



Anish N. Bhurva, MBBS,^{1,2} Andrew D'Silva, MBBS,¹ Camilla Torlasco, MD,^{1,2} Siana Jones, PhD,¹
Nirumila Nadarajan, MBBS,¹ Jet Van Zalen, MSc,¹ Nish Chaturvedi, PhD,¹ Guy Lloyd, MD,¹ Sanjay Sharma, MD,¹

CONCLUSIONS

Training and completion of a first-time marathon result in beneficial reductions in BP and intrinsic aortic stiffening in healthy participants. These changes are equivalent to approximately a 4-year reduction in vascular age. Greater benefit was observed in older, slower, male marathon runners with higher baseline blood pressure.

participants with slower running times ($p < 0.05$ for all).

CONCLUSIONS Training for and completing a marathon even at relatively low exercise intensity reduces central blood pressure and aortic stiffness—equivalent to a ~4-year reduction in vascular age. Greater rejuvenation was observed in older, slower individuals. (J Am Coll Cardiol 2020;75:60–71) © 2020 by the American College of Cardiology Foundation.

Training for a First-Time Marathon Reverses Age-Related Aortic Stiffening



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ASAN
Medical Center





1920년대 후반 한국 남성 기대수명: 38세

20세까지 생존한 자는 평균 59세까지 생존

남승룡

- 출생-사망: 1912년 11월 23일 ~ 2001년 2월 20일
- **향년:** 88세 (만 88세, 89세 생일 전 사망) 

손기정

- 출생-사망: 1912년 10월 9일 ~ 2002년 11월 15일
- **향년:** 90세

서윤복

- 출생-사망: 1923년 1.월 9일 ~ 2017년 6월 27일
- **향년:** 94세

Are these anecdotal findings?

Leisure-Time Running Reduces All-Cause and Cardiovascular Mortality Risk



Duck-chul Lee, PhD,* Russell R. Pate, PhD,† Carl J. Lavie, MD,†§ Xuemei Sui, MD, PhD,†
Timothy S. Church, MD, PhD,§ Steven N. Blair, PED||

ABSTRACT

N=55,137 (mean 44 yrs, 18-100) between 1974 and 2002

The Aerobics Center Longitudinal Study (prospective cohort)

Exclusion: MI, stroke, or cancer at baseline / <1 year of mortality

BACKGROUND Although running is a popular leisure-time physical activity, little is known about the long-term effects of running on mortality. The dose-response relations between running, as well as the change in running behaviors over time, and mortality remain uncertain.

OBJECTIVES We examined the associations of running with all-cause and cardiovascular mortality risks in 55,137 adults, 18 to 100 years of age (mean age 44 years).

RESULTS During a mean follow-up of 15 years, 3,413 all-cause and 1,217 cardiovascular deaths occurred. Approximately 24% of adults participated in running in 1974. Compared with nonrunners, runners had 30% and 45% lower adjusted risks of all-cause and cardiovascular mortality, respectively, with a 1-year life expectancy benefit. In dose-response analyses, the mortality benefits in runners were similar across quintiles of running time, distance, frequency, amount, and speed, compared with nonrunners. Weekly running even <51 min, <6 miles, 1 to 2 times, <506 metabolic equivalent-minutes, or 500 to 999 min/week was sufficient to reduce mortality risk compared with nonrunners. In the analyses of change in running behaviors and mortality, persistent runners had the most significant benefits, with 29% and 50% lower risks of all-cause and cardiovascular mortality, respectively, compared with never-runners.

CONCLUSIONS Running, even 5 to 10 min/day and at slow speeds <6 miles/h, is associated with markedly reduced risks of death from all causes and cardiovascular disease. This study may motivate healthy but sedentary individuals to begin and continue running for substantial and attainable mortality benefits. (J Am Coll Cardiol 2014;64:472-81)

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24% runners

Mean follow-up 15 yrs

Leisure-Time Running and All-Cause Mortality

Duck-chul Lee, PhD,* Raquel E. Black, PhD,* Timothy S. Church, MD, PhD,*

ABSTRACT

BACKGROUND Although the benefits of running on mortality, time, and mortality remain unclear, the potential benefits of running on mortality remain unclear.

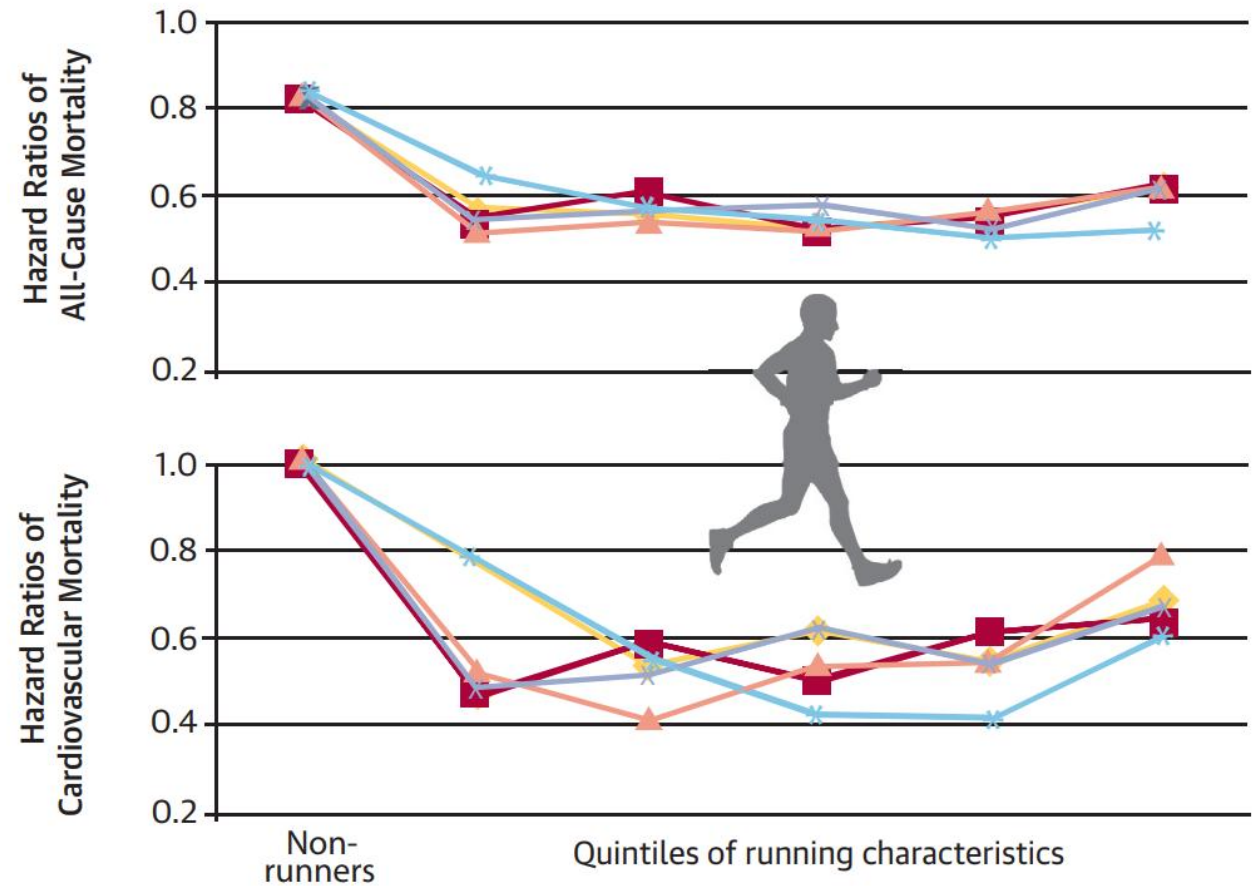
OBJECTIVES We examined the association between running and all-cause mortality in adults, 18 to 100 years of age.

METHODS Running was measured by self-report of running time, distance, frequency, total amount, and speed, compared with non-runners.

RESULTS During a median follow-up of 10.5 years, 24% of adults participated in running. In multivariable-adjusted analyses, the risk of all-cause mortality was significantly lower in runners than in non-runners, regardless of running time, distance, frequency, total amount, or speed. The risk of all-cause mortality was significantly lower in runners than in non-runners, regardless of running time, distance, frequency, total amount, or speed.

CONCLUSIONS Running was associated with a lower risk of death from all causes in adults, regardless of running time, distance, frequency, total amount, or speed. These findings suggest that running may be a beneficial physical activity for reducing the risk of death from all causes.

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	Time (min/wk)	0	<51	51-80	81-119	120-175	≥176
	Distance (miles/wk)	0	<6	6-8	9-12	13-19	≥20
	Frequency (times/wk)	0	1-2	3	4	5	≥6
	Total amount (MET-min/wk)	0	<506	506-812	813-1199	1200-1839	≥1840
	Speed (mph)	0	<6.0	6.0-6.6	6.7-7.0	7.1-7.5	≥7.6

Leisure-Time Running Reduces All-Cause and Cardiovascular Mortality Risk



CONCLUSIONS

We found consistent long-term mortality benefits of leisure-time running. This study underlined that running even at relatively low doses (5 to 10 min/day), below the current minimum guidelines of vigorous-intensity aerobic activity, was sufficient for substantial mortality benefits.

of change in running behaviors and mortality, persistent runners had the most significant benefits, with 29% and 50% lower risks of all-cause and cardiovascular mortality, respectively, compared with never-runners.

CONCLUSIONS Running, even 5 to 10 min/day and at slow speeds <6 miles/h, is associated with markedly reduced risks of death from all causes and cardiovascular disease. This study may motivate healthy but sedentary individuals to begin and continue running for substantial and attainable mortality benefits. (*J Am Coll Cardiol* 2014;64:472-81)

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Leisure-Time Running Reduces All-Cause and Cardiovascular Mortality Risk



CONCLUSIONS

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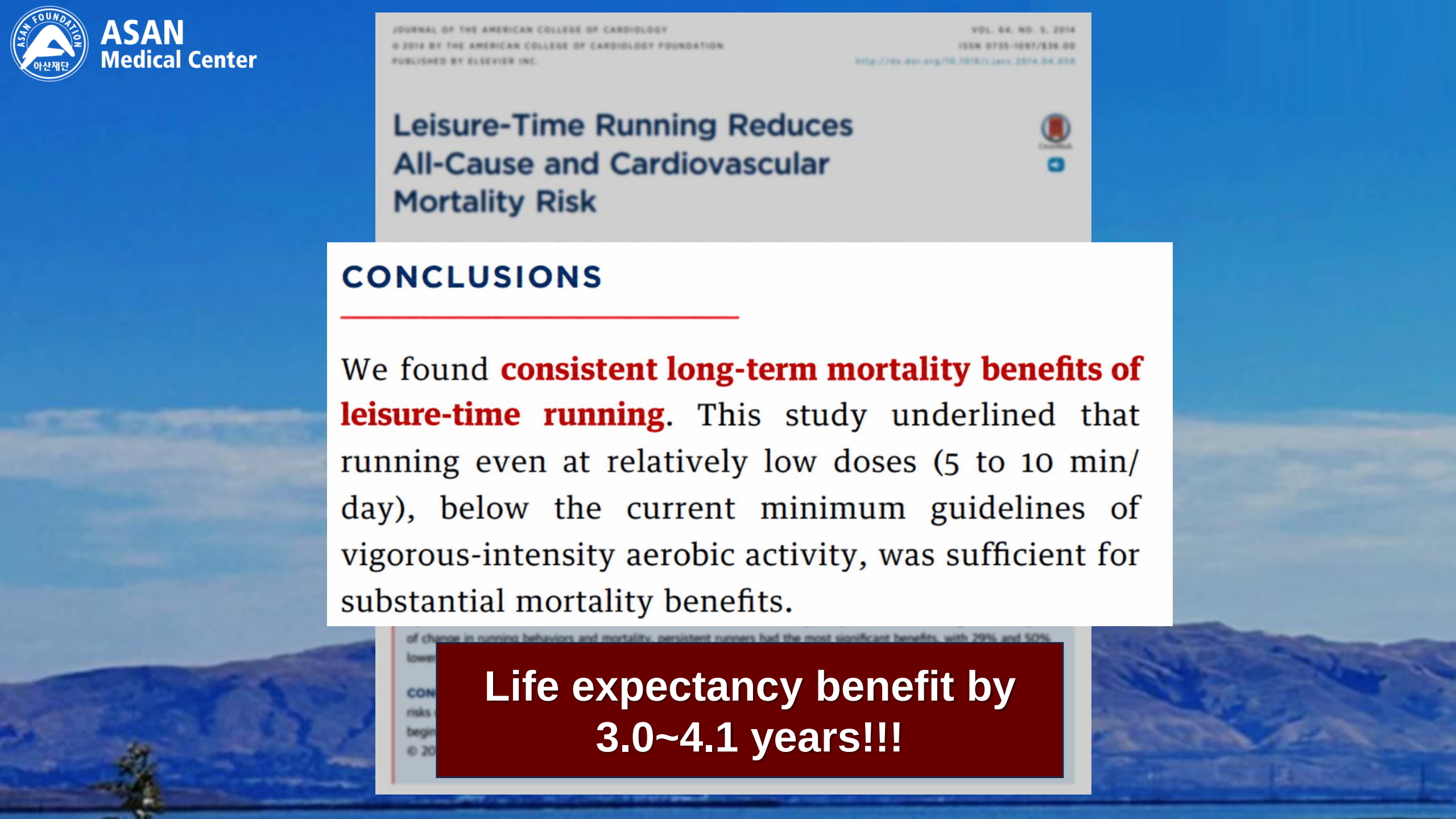
of change in running behaviors and mortality, persistent runners had the most significant benefits, with 29% and 50% lower risks of all-cause and cardiovascular mortality, respectively, compared with never-runners.

CONCLUSIONS Running, even 5 to 10 min/day and at slow speeds <6 miles/h, is associated with markedly reduced risks of death from all causes and cardiovascular disease. This study may motivate healthy but sedentary individuals to begin and continue running for substantial and attainable mortality benefits. (J Am Coll Cardiol 2014;64:472-81)
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CONCLUSIONS

We found **consistent long-term mortality benefits of leisure-time running**. This study underlined that running even at relatively low doses (5 to 10 min/day), below the current minimum guidelines of vigorous-intensity aerobic activity, was sufficient for substantial mortality benefits.

The background of the entire slide is a scenic photograph of a calm lake reflecting a clear blue sky, with rolling mountains in the distance. A small, dark silhouette of a tree is visible on the left side of the lake.

**Life expectancy benefit by
3.0~4.1 years!!!**

Is running associated with a lower risk of all-cause, cardiovascular and cancer mortality, and is the more the better? A systematic review and meta-analysis

Zeljko Pedisic ¹, Nipun Shrestha ¹, Stephanie Kovalchik,¹
Emmanuel Stamatakis ^{2,3}, Nucharapon Liangruenrom,^{1,4} Jozo Grgic ¹,
Sylvia Titze,⁵ Stuart JH Biddle,⁶ Adrian E Bauman,³ Pekka Oja⁷

► Additional material is published online only. To view please visit the journal online (<http://dx.doi.org/10.1136/bjsports-2018-100493>).

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Accepted 1 April 2019
Published Online First
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ABSTRACT

Objective To investigate the association of running participation and the dose of running with the risk of all-cause, cardiovascular and cancer mortality.

Design Systematic review and meta-analysis.

Data sources Journal articles, conference papers and doctoral theses indexed in Academic Search Ultimate, CINAHL, Health Source: Nursing/Academic Edition, MasterFILE Complete, Networked Digital Library of Theses and Dissertations, Open Access Theses and Dissertations, PsycINFO, PubMed/MEDLINE, Scopus, SPORTDiscus and Web of Science.

Eligibility criteria for selecting studies Prospective cohort studies on the association between running or jogging participation and the risk of all-cause, cardiovascular and/or cancer mortality in a non-clinical population of adults were included.

Results Fourteen studies from six prospective cohorts with a pooled sample of 232 149 participants were included. In total, 25 951 deaths were recorded during 5.5–35 year follow-ups. Our meta-analysis showed that running participation is associated with 27%, 30% and 23% lower risk of all-cause (pooled adjusted hazard ratio (HR)=0.73; 95% confidence interval (CI) 0.68 to 0.79), cardiovascular (HR=0.70; 95% CI 0.49 to 0.98) and cancer (HR=0.77; 95% CI 0.68 to 0.87) mortality, respectively, compared with no running. A meta-regression analysis showed no significant dose–response trends for weekly frequency, weekly duration, pace and the total volume of running.

Conclusion Increased rates of participation in running, regardless of its dose, would probably lead to substantial improvements in population health and longevity. Any amount of running, even just once a week, is better than no running, but higher doses of running may not necessarily be associated with greater mortality benefits.

World Health Organization (WHO) guidelines for MVPA¹) is associated with a 28% higher risk of all-cause mortality, compared with sufficient MVPA.¹⁵ Considering the high levels of physical inactivity globally, Lee and colleagues estimated that more than 5 million premature deaths a year would be prevented if physically inactive people became sufficiently active.¹⁵ Considerable interest has also been shown in the effects of different types of physical activity (eg, walking, cycling, running, swimming) on health and risk of premature mortality.^{17–24} In other words, for a given amount of MVPA, does the type of physical activity matter?

Running is among the most popular types of physical activity. It has been estimated that each month around 3.7 million (8.5%) English adults take part in running as a sport or recreational activity.²⁵ Other countries, such as Australia²⁶ and the USA,²⁷ also have high participation rates. The 2017 Physical Activity Council's survey ranked running in the top 10 preferred activities in which inactive 25–44-year-old US adults wished to take part.²⁸ Given its popularity, running has great potential for improving population health. The Royal College of General Practitioners (RCGP) has acknowledged this potential by partnering with the *parkrun* UK initiative, to promote the uptake of running and walking among general practitioners and their patients.²⁹

In a systematic review, Oja *et al*¹⁷ concluded that the evidence for health benefits is scarce for participation in all sports except for running and football. The authors concluded that there is (i) moderate evidence for the associations between running and improved aerobic fitness, cardiovascular function and running performance; (ii) limited evidence for associations of running with improvements

Is running associated with a lower risk of all-cause, cardiovascular and cancer mortality, and is the more the better? A systematic review and meta-analysis

Zeljko Pedaric  [†] Miran Chertok  [†] Stanislav Kozulchik [†]
Emmanuel
Sylvia Titze

► Additional material is published online only. To view please visit the journal online (<http://dx.doi.org/10.1136/bmj-2018-024933>).

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4 November 2019

ABSTRACT

Objective: To participate in a all-cause, and **Design:** Systematic review. **Data sources:** Cochrane Central Register of Controlled Trials, Cochrane Database of Systematic Reviews, EMBASE, MEDLINE, and SPORTDiscus. **Eligibility criteria:** Randomized controlled trials of jogging per cardiovascular population of. **Results:** Four with a pooled included. In to 5.5–35 years for running partic 23% lower risk ratio (HR)=0.7, 0.79), cardiovascular and cancer (HR respectively). O regression ana trends for were the total volu. **Conclusion:** regardless of i improvements amount of run than no runner necessarily be

42 full-text publications
assessed for eligibility

13 publications included
in the primary search

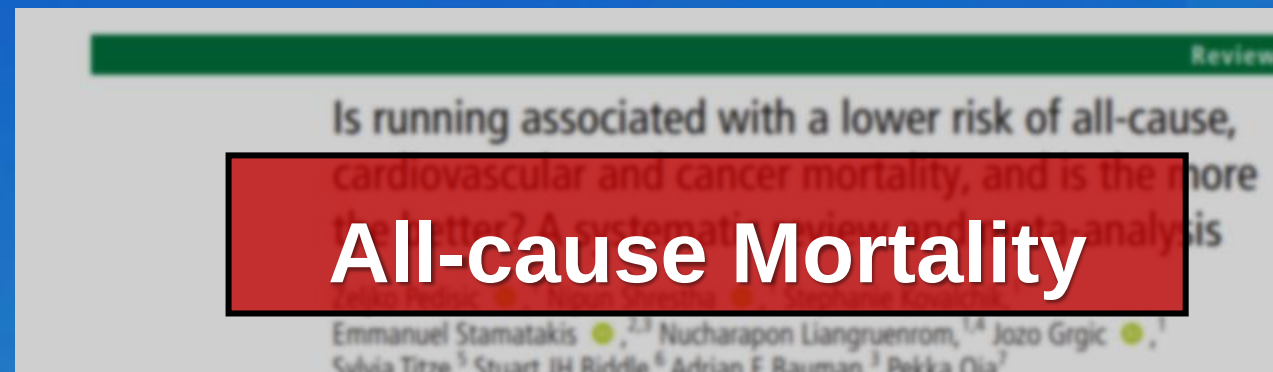
14 publications from 6 cohorts included

29 studies excluded

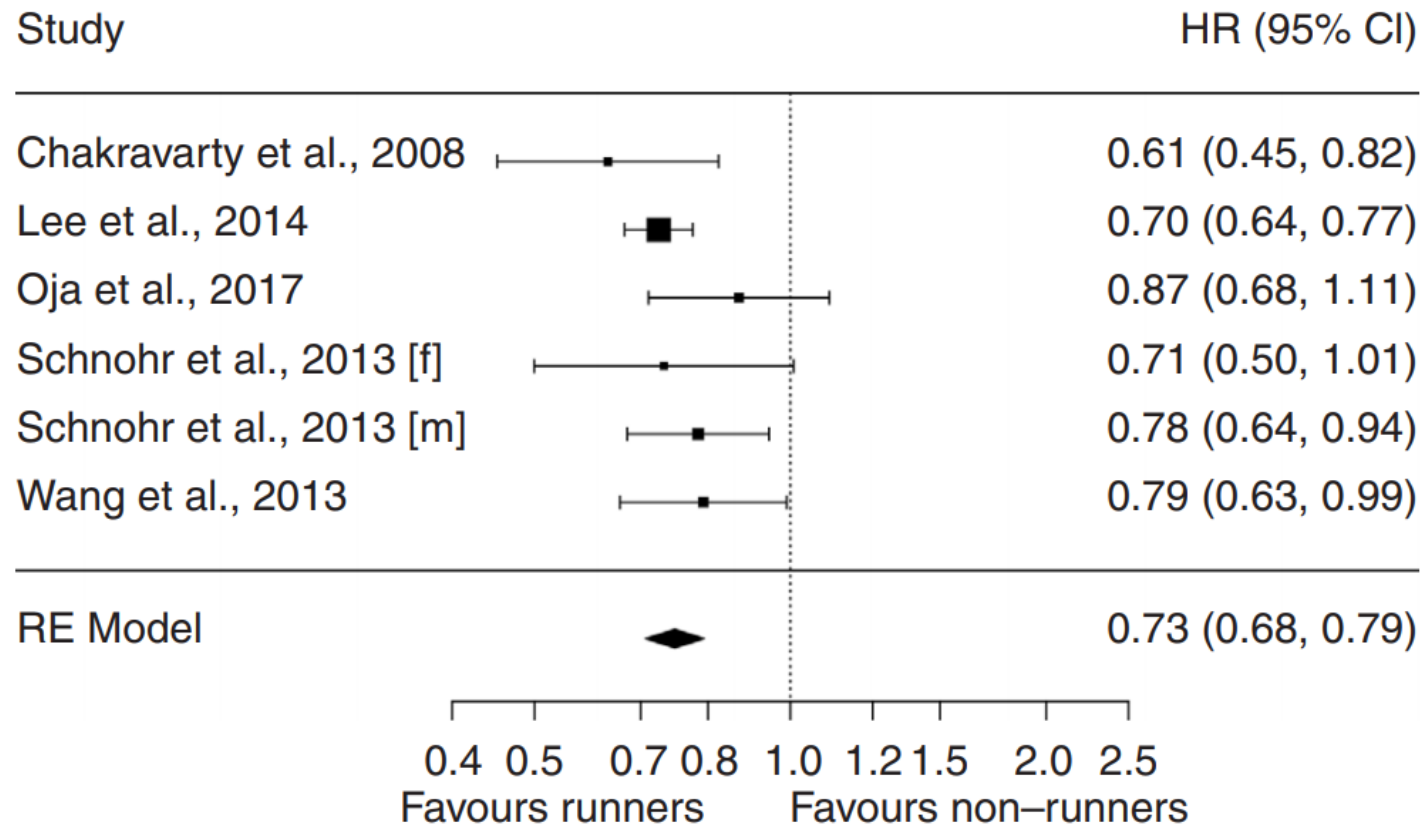
- 4 studies: Did not include running vs. not running as an explanatory variable
- 2 studies: Did not include mortality as the outcome variable
- 5 studies: Relevant findings available in another publication
- 18 studies: Not a primary research article

Eligible publications
identified in the
secondary search

- 1 article from the reference lists of included papers

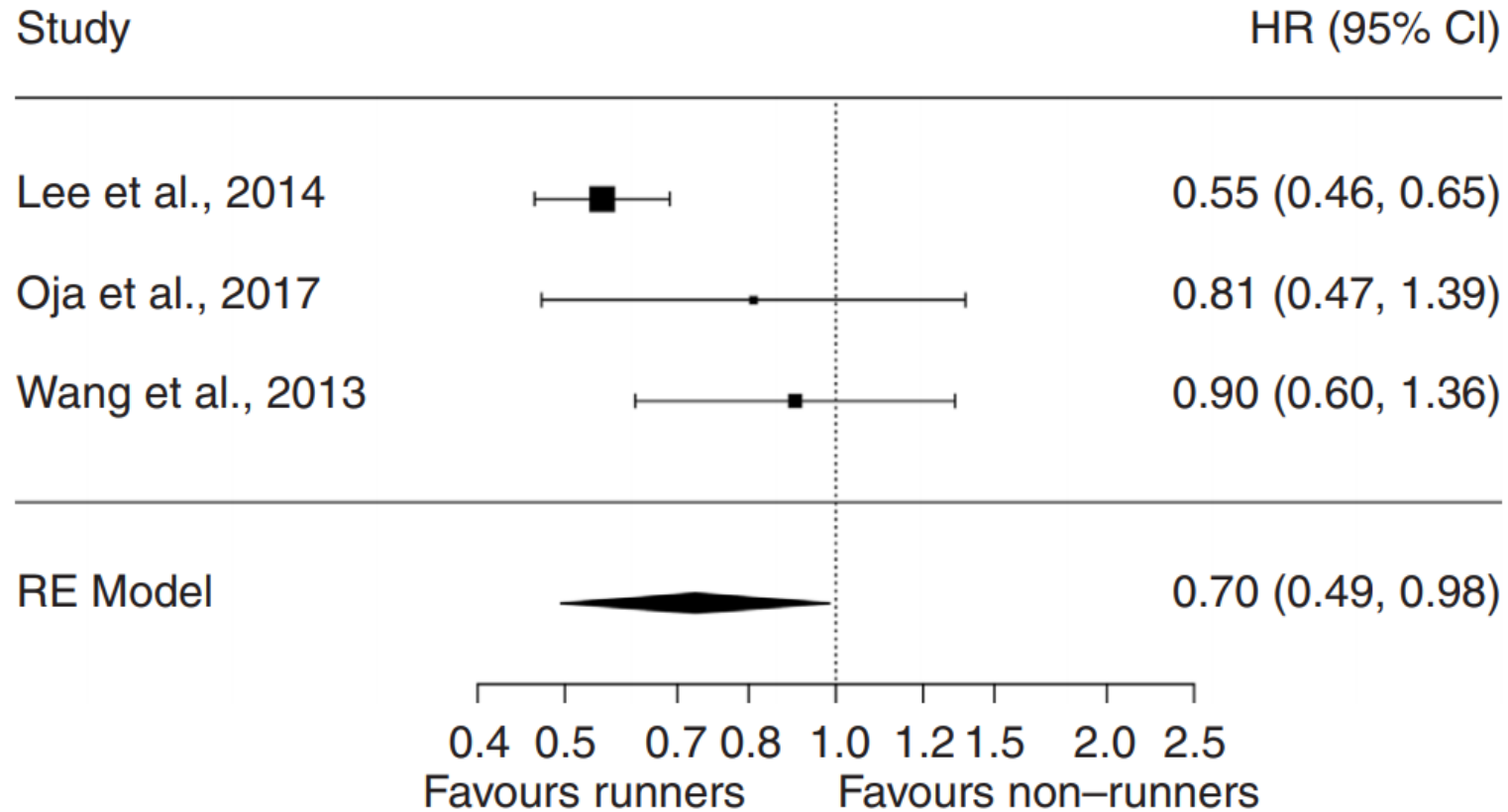


All-cause Mortality

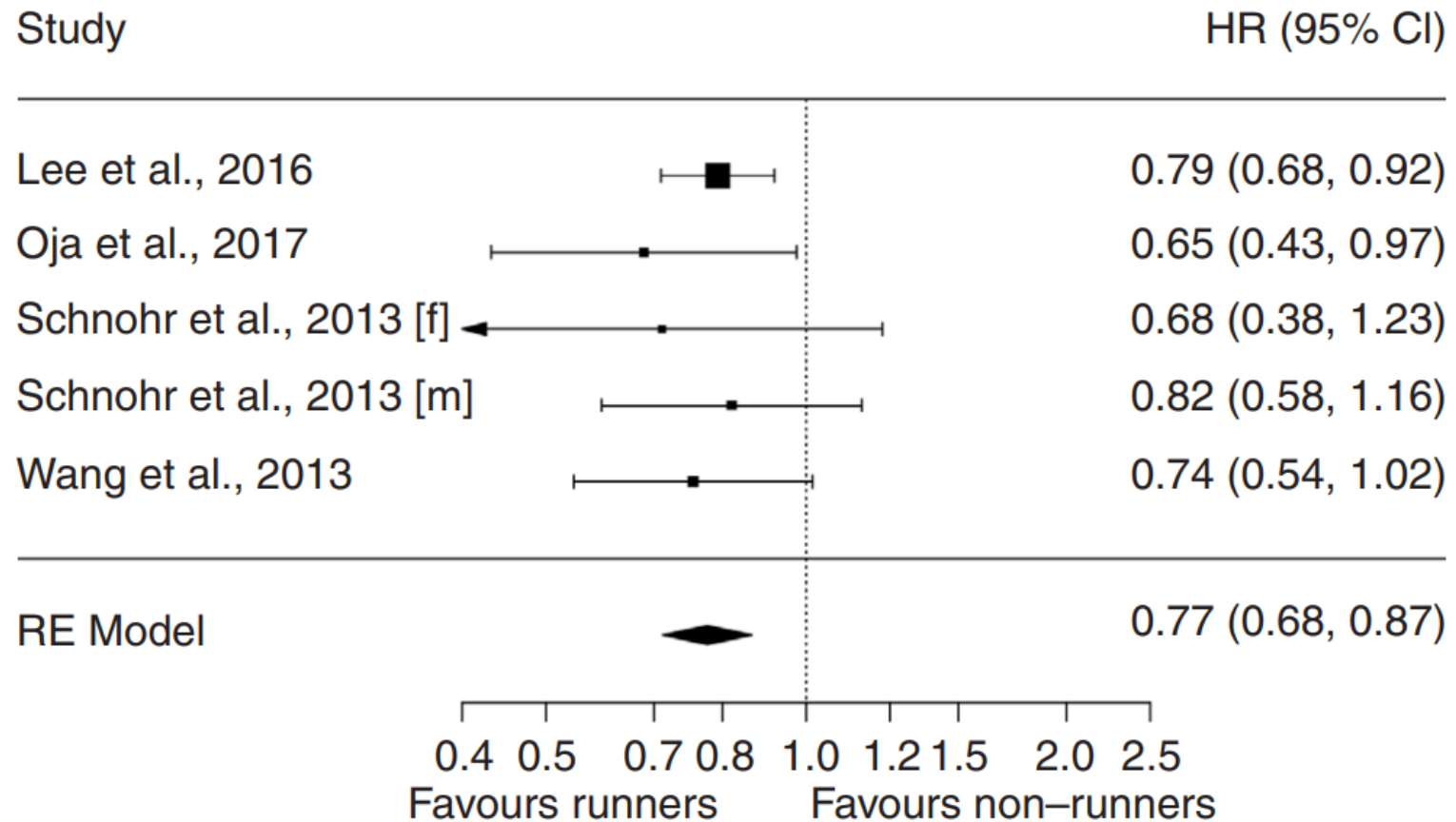


Is running associated with a lower risk of all-cause, cardiovascular and cancer mortality, and is the more the better? A systematic review and meta-analysis

Zeljko Pedisic^{1,2,3}, Nucharapon Liangruenrom^{1,4}, Jozo Grgic¹, Emmanuel Stamatakis^{2,3}, Sylvia Titze⁵, Stuart JH Biddle⁶, Adrian E Bauman³, Pekka Oja⁷



Cancer Mortality



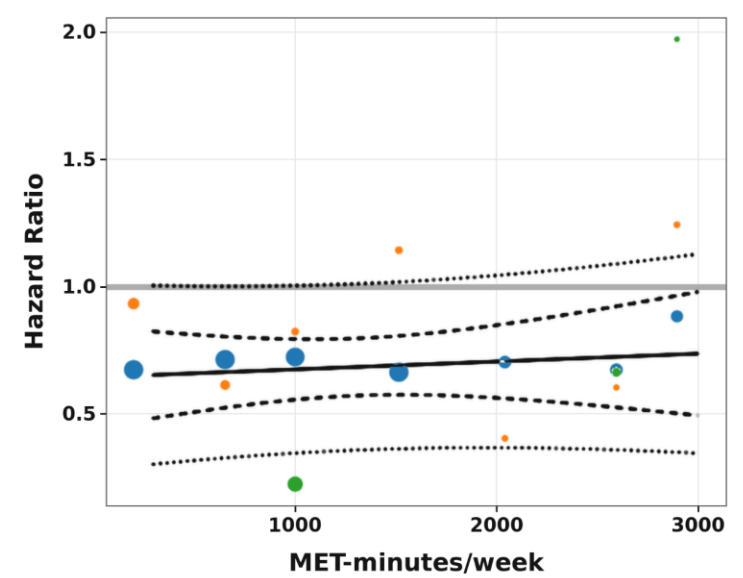
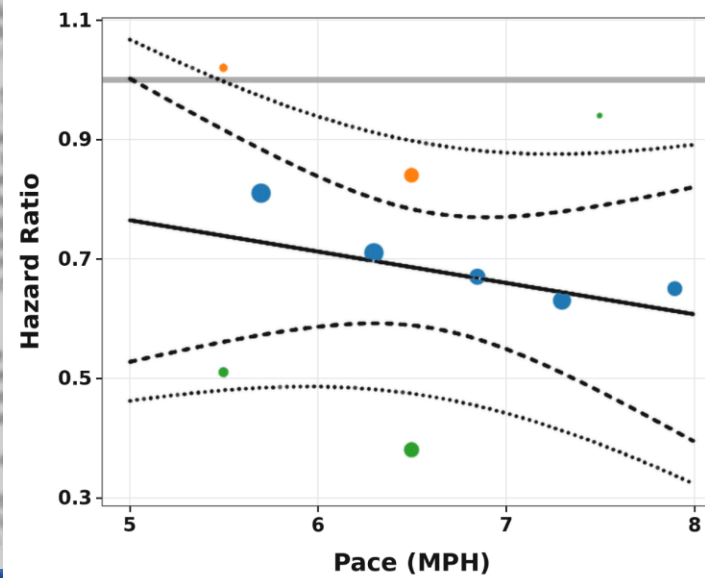
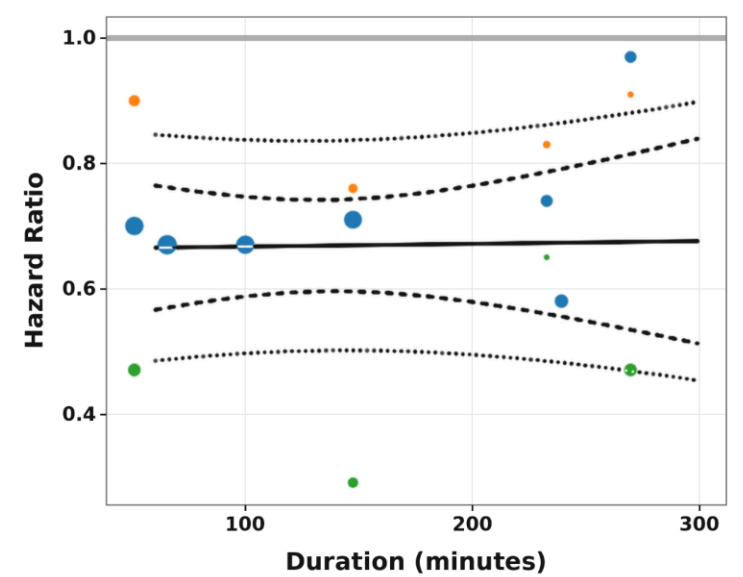
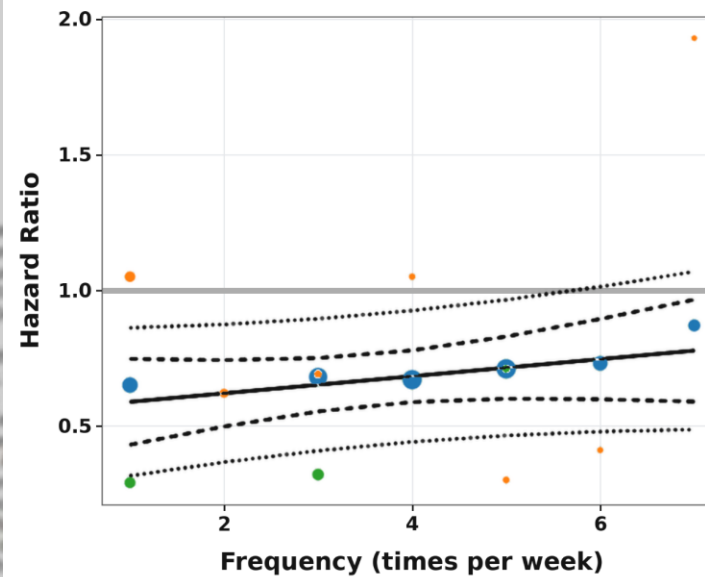
Is running associated with a lower risk of all-cause, cardiovascular and cancer mortality, and is the more

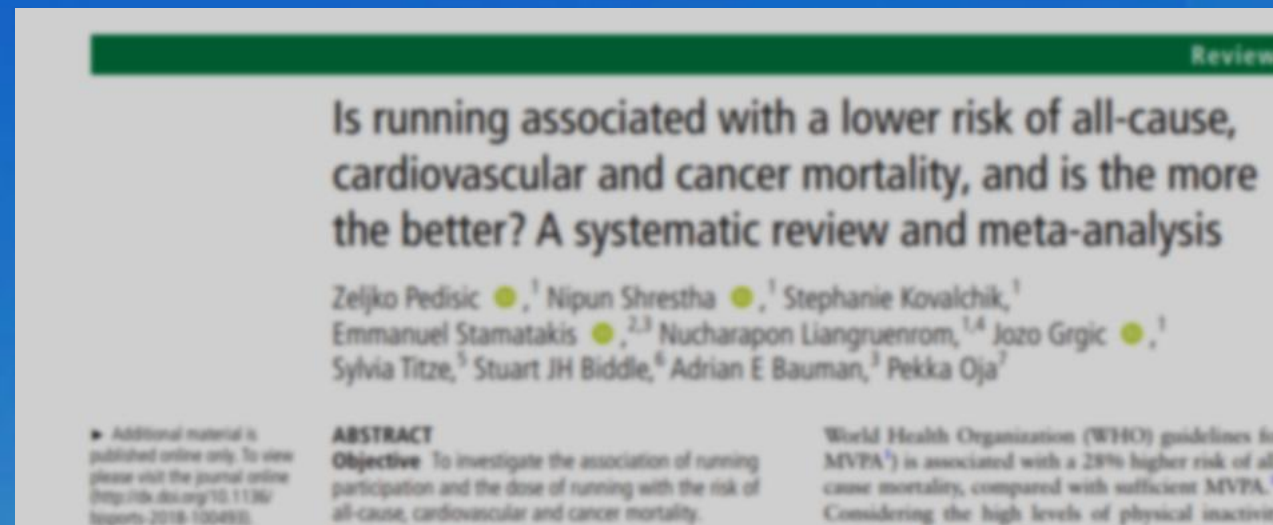
Additional materials published online to please visit the journal (<http://dx.doi.org/10.1016/j.ajph.2019.100>)

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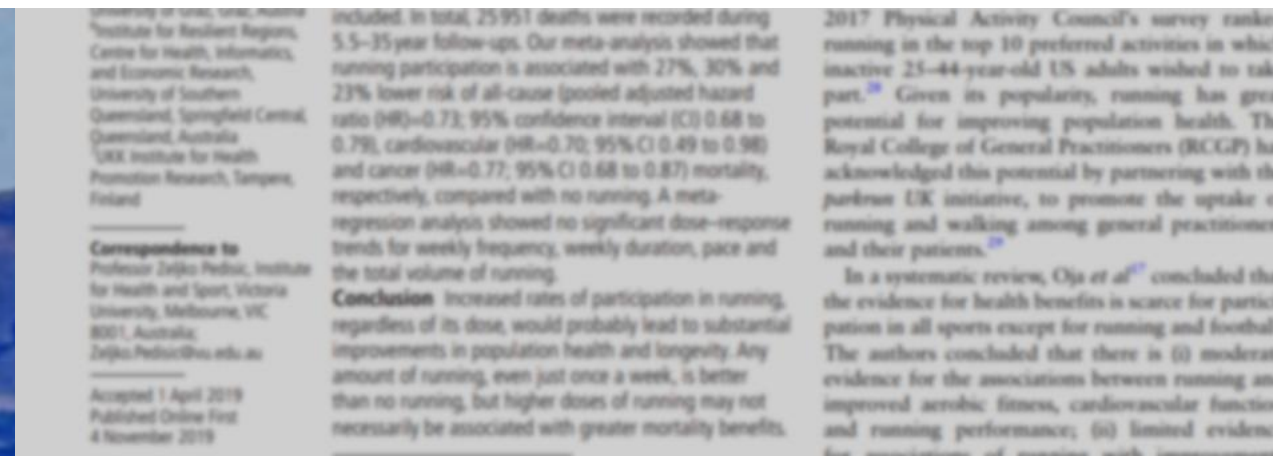
Accepted 1 April 2019
Published Online 14 November 2019





Conclusions

Running participation is associated with a significantly lower risk of all-cause, cardiovascular and cancer mortality, compared with no running.



O...OK but Why cancer mortality decreased?



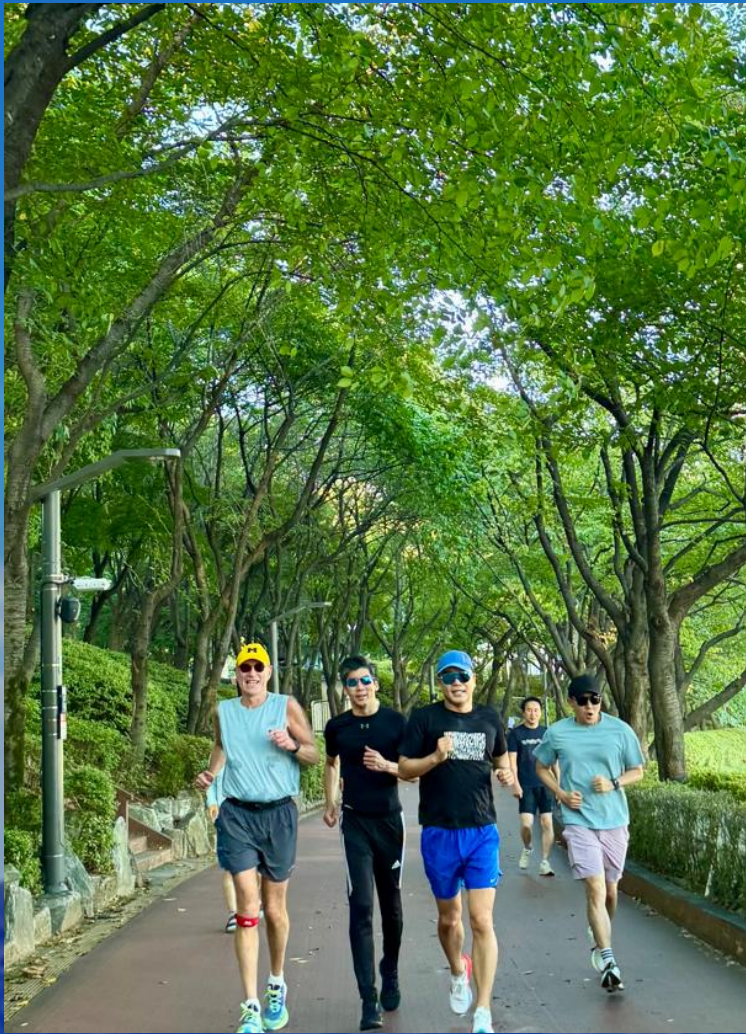
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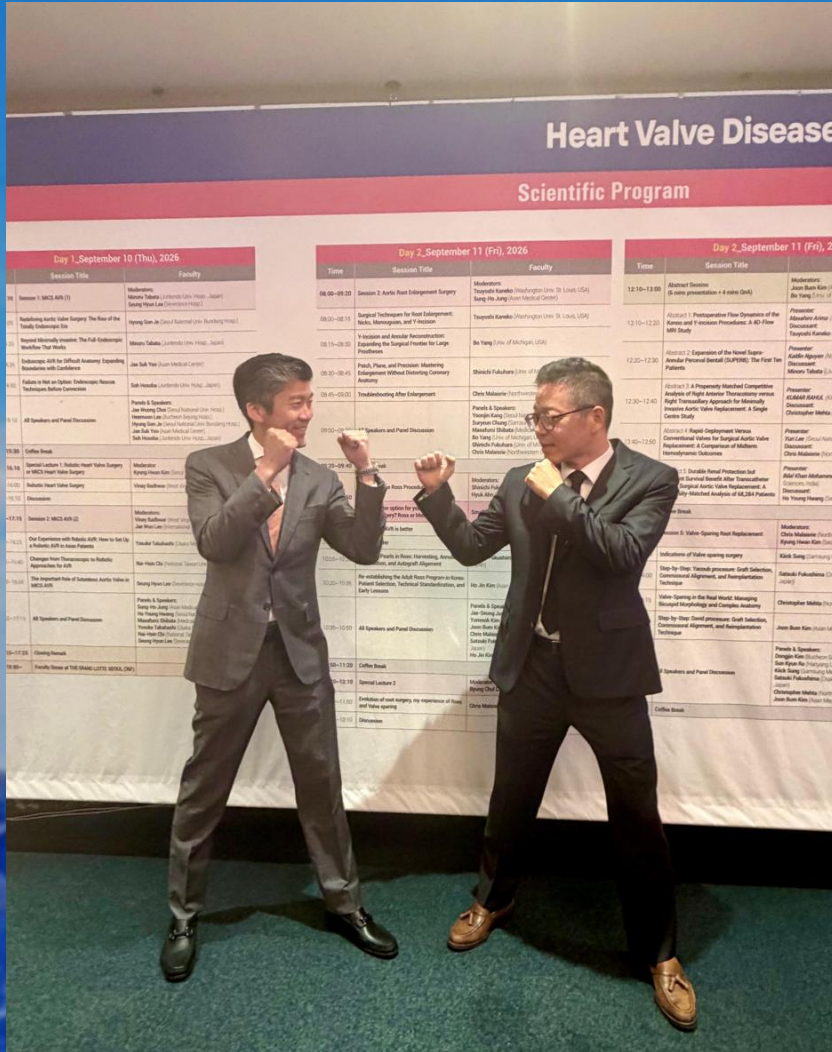






아...압이 생기기가 쉽지가 않다...

Sept 2026



Sept 2026

STS-Korea Heart Valve Disease Forum





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Sept 2026

Asan, PNUYH, NCVC, Osaka Univ





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2026 AATS, Chicago





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**CT SURGERY
TRANSLATIONAL
SURGEON SCIENTIST
VISITING PROFESSORSHIP**

2016	Todd K. Rosengart, MD
2016	Ralph J. Damiano, Jr., MD
2017	Frank W. Sellke, MD
2024	Joon Bum Kim, MD



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그런데 카본화는 도움이 되는건가요…?



Sports Medicine (2021) 51:371–378
<https://doi.org/10.1007/s40279-020-01420-7>

CURRENT OPINION



Recent Improvements in Marathon Run Times Are Likely Technological, Not Physiological

Borja Muniz-Pardos¹ · Shaun Sutehall² · Konstantinos Angeloudis³ · Fergus M. Guppy^{4,5}  · Andrew Bosch² · Yannis Pitsiladis^{3,6} 



scientific reports



OPEN

Influence of advanced shoe technology on the top 100 annual performances in men's marathon from 2015 to 2019

Víctor Rodrigo-Carranza¹, Fernando González-Mohino^{1,3}, Jesús Santos del Cerro², Jordan Santos-Concejero⁴ & José María González-Ravé^{1✉}

The NIKE Vaporfly shoe was introduced in May 2017 as part of the original #Breaking2 Project (an event aimed to run the first marathon under 2 h). This new advanced shoe technology (NAST) changed the footwear design conception. The aim of this study was (i) to analyse the effect of NAST in men's marathon performance, (ii) to analyse whether the changes in the environmental constraints (temperature and wind) and orography of the marathons, age and birthplace of the runners has changed from 2015 to 2019 and (iii) to analyse the impact of NAST on the historical 50 best performances. Data from top-100 men's marathon performances were collected in that timeframe. The shoes used by the athletes were identified (in 91.8% of the cases) by publicly available photographs. External and environmental conditions of each marathon and age and birthplace of the runners were also analysed. Marathon performances improved from 2017 onwards between 0.75 and 1.50% compared to 2015 and 2016 ($p < 0.05$). In addition, the improvement was greater in the upper deciles than in the lower ones ($p < 0.001$). Runners wearing NAST ran ~1% faster in marathon compared to runners that did not use it ($p < 0.001$). When conducting an individual analysis of athletes who ran with and without NAST, 72.5% of the athletes who completed a marathon wearing NAST improved their performance by 0.68% ($p < 0.01$). External and environmental conditions, age or birthplace of runners seems not to have influenced this performance improvement. NAST has had a clear impact on marathon performance unchanged in the environmental constraints (temperature and wind), orography, age, and birthplace of the runners but with differences between venues.

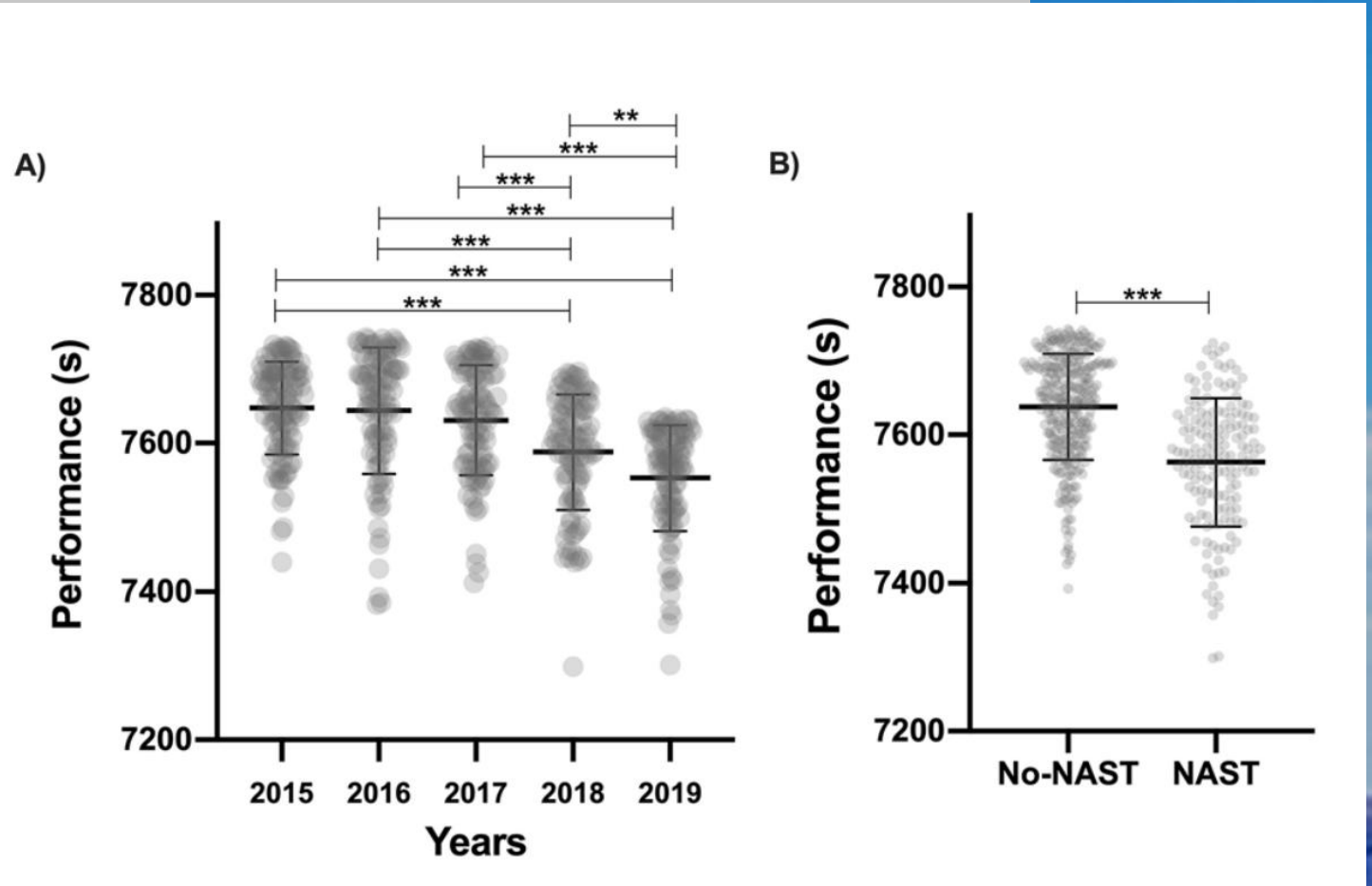
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who ran with and without NAST. 73.6% of the athletes who completed a marathon wearing NAST improved their performance. The birthplace of runners seems to have a clear impact on marathon performance (wind), orography, age, and



NAST
 = Nike Advanced Shoe Technology

scientific reports



OPEN

The role of footwear in improving running economy: a systematic review with meta-analysis of controlled trials

Liya Xu, Yifan Wang & Xu Wen✉

This systematic review aimed to explore the impact of different types of footwear and footwear characteristics on the running economy (RE) of long-distance runners and providing guidance for running enthusiasts and clinical practice. A comprehensive search of Web of Science, PubMed, SPORTDiscus, SCOPUS, and the China National Knowledge Infrastructure (CNKI) databases from inception to April 2024 was performed. Trials evaluating the RE of adults participating in long-distance running included comparing different footwear characteristics. This review followed the PRISMA statement. Two reviewers screened titles and abstracts to make a relevant shortlist, then retrieved and evaluated full texts against inclusion criteria for eligibility. Two independent reviewers evaluated the methodological quality of each included analysis by employing the Physiotherapy Evidence Database Scale (PEDro scale). The standardized mean difference (SMD) for the results of RE studies in each study was calculated. Of the 1338 records retrieved, 26 studies were identified in the systematic review and meta-analysis. Limited evidence indicated that compared with shod running, barefoot running (SMD = -0.50 [95% CI -0.86, -0.14], $P=0.006$) and minimalist running (SMD = -0.62 [95% CI -0.83, -0.42], $P<0.00001$) had a positive impact on RE. Compared with barefoot running, minimalist running did not show a beneficial effect (SMD = 0.37 [95% CI -0.07, 0.81], $P=0.10$) on RE. Additionally, compared with the control condition, RE showed some improvement with increased footwear longitudinal bending stiffness (SMD = -0.53 [95% CI -0.90, -0.17], $P=0.005$) and cushioning (SMD = -0.33 [95% CI -0.61, 0.06], $P=0.02$). However, compared with control, RE did not change with footwear comfort (SMD = -0.11 [95% CI -0.42, 0.21], $P=0.51$). Barefoot running or minimalist running may be more economical than shod running, high longitudinal bending stiffness and high cushioning shoes could improve RE.

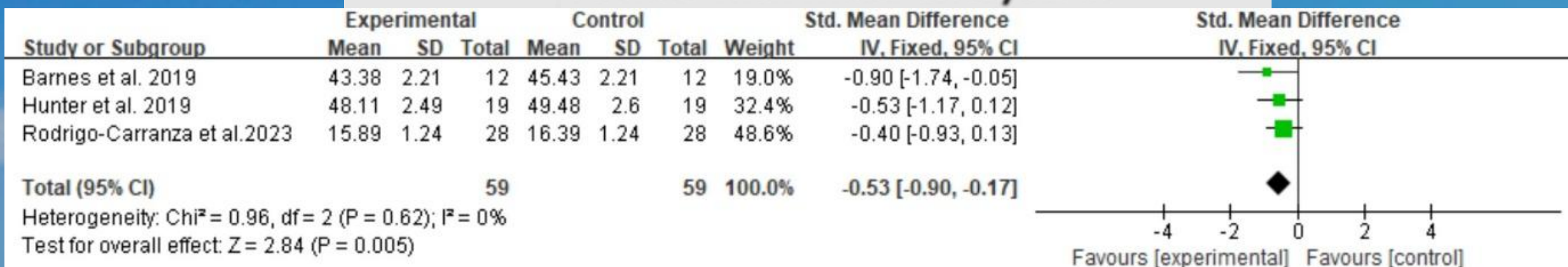
Keywords Running economy, Footwear, Meta-analysis

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The role of footwear in improving running economy: a systematic review with meta-analysis of

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Keywords Running economy, Footwear, Meta-analysis



Recent Improvements in Marathon Run Times Are Likely Technological, Not Physiological

Borja Muniz-Pardos¹ · Shaun Sutehall² · Konstantinos Angeloudis³ · Fergus M. Guppy^{4,5} · Andrew Bosch² · Yannis Pitsiladis^{3,6}

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Abstract

Every women's and men's world records from 5 km to the marathon has been broken since the introduction of carbon fibre plate (CFP) shoes in 2016. This step-wise increase in performance coincides with recent advancements in shoe technology that increase the elastic properties of the shoe thereby reducing the energy cost of running. The latest CFP shoes are acknowledged to increase running economy by more than 4% corresponding to a greater than 2% improvement in performance/run time. The recently modified rules for shoe technology in athletics, that includes sole thickness must not exceed 40 mm and must not contain more than one rigid embedded plate, appear contrary to the true essence and credibility of sport as access to this performance-defining technology becomes the primary differentiator of sporting performance in elite athletes. This is a particular problem in sports such as athletics where the primary sponsor of the athlete is very often a footwear manufacturing company. The postponement of the 2020 Summer Olympics provides a unique opportunity for reflection by the world of sport and time to commission an independent review to evaluate the impact of shoe technology on the integrity of sporting competition. A potential solution to solve this issue can involve the reduction of the sole height of a shoe to 20 mm and a future solution would be to limit shoe technology to only from a single manufacturer to avoid an impact on the energy cost of running and, therefore, determining the performance outcome.

Key Points

Recent world records in track and field, and the marathon, have been broken by athletes wearing carbon fibre plate (CFP) shoes. This step-wise increase in performance coincides with recent advancements in shoe technology that increase the elastic properties of the shoe thereby reducing the energy cost of running. The latest CFP shoes are acknowledged to increase running economy by more than 4% corresponding to a greater than 2% improvement in performance/run time. The recently modified rules for shoe technology in athletics, that includes sole thickness must not exceed 40 mm and must not contain more than one rigid embedded plate, appear contrary to the true essence and credibility of sport as access to this performance-defining technology becomes the primary differentiator of sporting performance in elite athletes. This is a particular problem in sports such as athletics where the primary sponsor of the athlete is very often a footwear manufacturing company. The postponement of the 2020 Summer Olympics provides a unique opportunity for reflection by the world of sport and time to commission an independent review to evaluate the impact of shoe technology on the integrity of sporting competition. A potential solution to solve this issue can involve the reduction of the sole height of a shoe to 20 mm and a future solution would be to limit shoe technology to only from a single manufacturer to avoid an impact on the energy cost of running and, therefore, determining the performance outcome.

Current shoe designs for road running, and more recently for track running, that include a CFP seem to greatly reduce the energy cost of running and, as a consequence, most long-distance road running records have been broken in the last 3 years by athletes wearing CFP shoes.

Current rules are therefore no longer fit for purpose, requiring revision to safeguard the integrity of sport. A potential solution to solve this issue can involve the reduction of the stack height of a shoe to 20 mm.

Electronic supplementary material The online version of this article (<https://doi.org/10.1007/s40279-020-01420-7>) contains supplementary material, which is available to authorized users.

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³ Collaborating Centre of Sports Medicine, University of Brighton, Eastbourne, UK

⁴ School of Pharmacy and Biomolecular Sciences, University of Brighton, Brighton, UK

✓ 4–5% advantage
✓ ~10–12 minutes for a 4-hour marathoner
✓ But individual running economy responses: 11.3% worsening ~11.4% improvement





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Boston

April 16, 2018



내가 보스턴 1등? 어리둥절한 日 30대 '공무원 러너'

아마추어 마라토너 가와우치, 122회 보스턴마라톤 깜짝 우승
체감 영하1도, 비바람 악천후 속 아프리카 강자들 모두 제쳐

주40시간 학교 근무 '투잡 러너'
초청료·후원 없이 자비 출전 "빨리 돌아가 일 끝내야하는데..."

이순홍 기자

입력 2018.04.18. 03:00

결승선을 가장 먼저 통과한 남자는 여전히 어리둥절한 표정이었다. 그를 부축한 자원봉사자가 "당신이 1등이에요"라고 말하자 두 눈이 휘둥그렇게 변했다. 그러곤 두 손을 번쩍 들어 포효했다. 비 내리는 보스턴 한복판, 땀과 눈물로 범벅 된 '공무원 마라토너' 가와우치 유키(31·일본)는 세상을 다 가진 듯한 얼굴이었다.



강추위와 비바람 속에서 보스턴의 기적을 쓴 건 일본의 30대 '공무원 러너'였다. 가와우치 유키가 17일(한국 시각) 제122회 보스턴 마라톤에서 가장 먼저 결승선을 끊고 두 팔을 번쩍 든 모습. 자신의 우승이 믿기지 않는 듯 어리둥절한 표정이다.

주의사항

정신력은 **평소의 부지런한 인내와 성실**함으로 발휘되는 것이고,

마라톤 기록은 당일 날씨와 직전 컨디션 난조, 부상 등의 외부적 요인을 제하면 **경기 2주전 이미 다 결정** 된다.

경기 당일에는 오히려 겸허하고 **지혜롭게 체력을 관리**하며, **온전하게 마무리** 하는 것이 바른 길이다.



2024

Napa Valley
JTBC 서울

2025

고구려마라톤
서울 (동아)
홋카이도
공주백제
JTBC 서울

2026

제주도
서울(동아)
아오모리
하코다테
Sydney
Chicago

2024

Napa Valley
JTBC 서울

2025

고구려마라톤
서울 (동아)
홋카이도
공주백제
JTBC 서울

2026

제주도
서울(동아)
아오모리
하코다테
Sydney
Chicago



2024

Napa Valley
JTBC 서울

2025

고구려마라톤
서울 (동아)
홋카이도
공주백제
JTBC 서울

2026

제주도
서울(동아)
아오모리
하코다테
Sydney
Chicago

Hokkaido, Aug 2025



Seoul, Mar 2026





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Hakodate, Jun 2026



Sydney, Aug 2026



Chicago, Oct 2026





2025
대한심장혈관흉부외과학회
제57차 추계학술대회



제 1회 Fun Run Festival

일시 2025년 10월 30일(목) 오전 6:00
코스 인터불고호텔 금호강 건너 화랑교 앞 쉼터 → 아양교 반환점 → 복귀 (총 5km, 예상 소요시간 30-40분)

Sponsored by 

 대한심장혈관흉부외과학회
The Korean Society for Thoracic & Cardiovascular Surgery

Hotel Inter-Burgo

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Move Sport



42.195

Thank you



