

## Exhibit E

Articles on Walking, Exercise Surfaces and Loneliness



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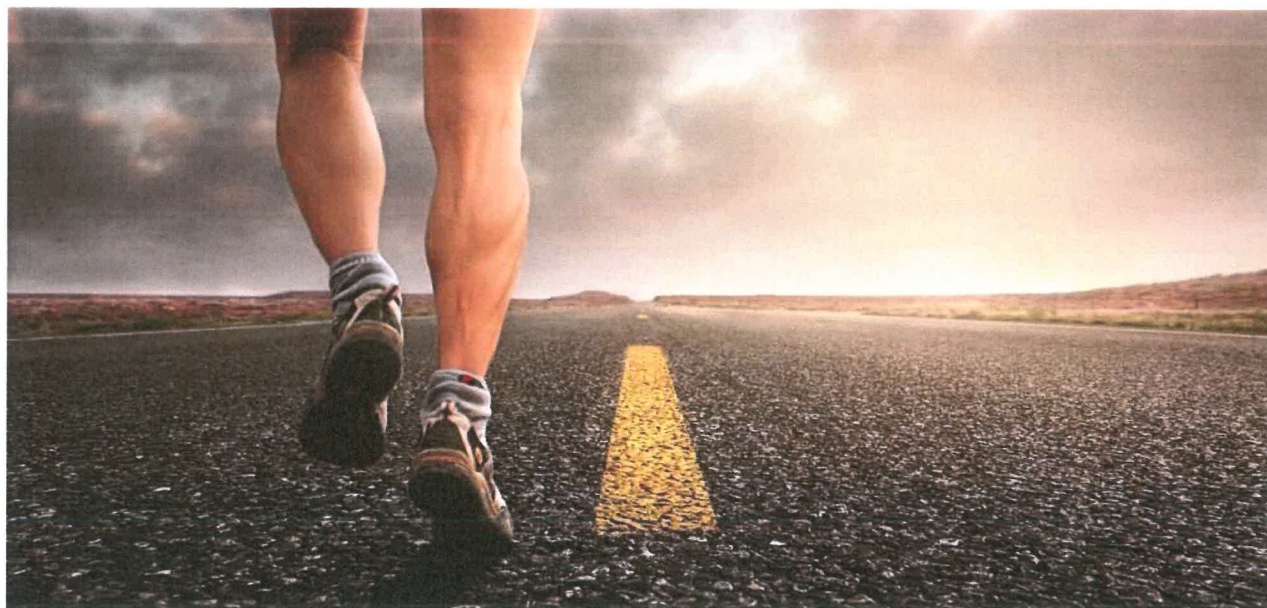


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# How Running Surfaces Affect Your Body

by [Angie Spencer](#) on [October 20, 2017](#) in [Injury](#)



**L**et's talk about why it's important to vary your running surfaces. As runners we often become creatures of habit and run the same routes on the same surfaces week after week.

Depending on the type of mileage and surfaces you run on, doing the same thing over and over again may result in overuse injuries or muscle stagnation.

However, large studies haven't yet shown a connection between running injuries and whether you routinely run on hard or soft surfaces.

As we run the muscles and tendons act as shock absorbers as your foot lands and then they release energy during the push off phase. The surface that you run on and your running shoes (or lack) also function to absorb and release energy.

The body takes the information from your previous footstrikes (and what your brain knows from experience) and adjusts muscle contractions before the next time your foot hits the ground. Interestingly the body pre-tunes the muscles before your first step onto a new surface.

## How Running Surfaces Affect Your Body

Changing up your running surface every so often can challenge muscles in a new way and add novelty to your running routine. Softer surfaces like grass, dirt, trails and gravel reduce the force of impact with your running stride

and may allow you to recover more quickly from the workout.

Plus these softer surfaces require you to use stabilizing muscles that may grow lax on the road or sidewalk. Of course you want to train primarily on the type of surface and for the conditions that you'll be racing on. But doing at least one run per week on a different surface can be very beneficial.

## Types of running surfaces:

- **Concrete or cement**– Sidewalks by and large are made of concrete. They're usually very convenient and safer than the road in cities. However, this is the toughest surface on your muscles and joints (particularly knees and ankles). Concrete is 10 times harder than asphalt.
- **Asphalt** (mixture of gravel, tar and crushed rock)- Most roads are made of this and most road races will be run on asphalt. It also has more give than concrete but remains a stable surface. Road running does come with the hazards of a cambered or sloped shoulder (which can throw your body out of alignment), potholes, and the need to be very aware of traffic safety.

- **Cobblestones or brick**– this is a surface that is typically only seen on old roads and streets and it's one of the most tricky. It has the hardness of concrete but can often be uneven and require extra attention to your foot placement to avoid tripping.



Academy member Kristi Harris said the hardest aspect of the **Florence Marathon** in Florence, Italy was running on cobblestones.

- **Gravel/cinders** (what older tracks used to be made of): these are easier on the body when they're well maintained. But they're not an all weather surface so

the stability of your footing may vary depending on how wet the ground gets. With gravel the size of the rocks on the surface makes a difference in how comfortable they are to run on. Larger rocks increase the amount of stabilization the body has to do and may be tough for people who deal with ankle issues.

- **Dirt trails** are one of the gentlest surfaces for the body. However trails can vary widely in their condition and incline and may often be uneven, muddy, impassible, and have unaccounted hazards like rocks, downed trees or branches, pinecones, roots, etc making them notorious for ankle sprains. Trail running is an adventure and you should ease into it gradually if you're new to trails.
- **Wood chips or peat**– this surface is very gentle on the body but can be mixed in quality. A well maintained trail can be wonderful but these surfaces can often get wet or boggy and may be slippery.
- **Sand**– this surface fires up stability muscles that may not be used very often and is great for barefoot running. But sand can be uneven and unstable and

puts extra pressure on knees, Achilles tendons, calves, ankles and hips. It's best to start gradually with low miles and slowly work up to longer distances as your body tolerates it.

- **Grass**– this is one of the softest and most natural surfaces and can be good for runners who deal with impact type issues like bursitis and ITBS. However, grass can easily hide dangerous obstacles such as holes, roots, and rocks and you can easily run into things like ticks and dog poop and aggravate allergy symptoms.
- **Synthetic Track**– this is a soft and sturdy surface which has a bit of bounce making it easy on muscles and joints. It can be an ideal surface for someone who is slowly building back after an injury and a great place to do speed work. However the continual turns on a track can be hard for people who deal with calf and IT issues. And it can get a bit boring if you're trying to log multiple miles.
- **Treadmill**– the belt of a treadmill is cushioned and this helps reduce lower body impact. With an indoor

controlled climate it enables you to have a safe surface to run all year round. But treadmill running can be monotonous and it can be challenging to transition to road races since the belt helps propel you forward and the impact is so different.

- **Snow**– In many parts of the world most running surfaces may be covered with snow a portion of the year. Snow forces you to slow down a bit and have more awareness for your footing and environment. It can be fun to run through fresh snow but some hazards include narrowed roads, traffic patterns being less predictable, slick conditions, icy surfaces and slush. Snow can also hide curbs, potholes and other hazards.
- **Boardwalks**– MTA listener John is training for his first marathon and emailed to say this, “Some of us live by boardwalks. I am training for my first marathon and getting into the longer runs I have found going from concrete then onto the boardwalk very annoying. I prefer to stay on the concrete and not change running surfaces.” Boardwalks present a good option for many runners who live by the water. The wood surface is gentler to the body than pavement and usually separated from other types of traffic more common on



the road. Some downsides include irregularity of the boards due to warping from the weather which may make boards uneven and require more attention to your foot placement. Boards may also get slick in wet conditions and ice over during freezing weather.

**Sources:**

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## More From Coach Angie Spencer

[Staying Healthy During Marathon Training](#)

[How to Be a Defensive Runner](#)

# Best Walking Surfaces For Your Joints, Ranked

By  
[Julia Malacoff](#)



September 25, 2021



One of the best things about walking is you can do it anywhere, anytime making a workout accessible no matter where you go. But, any experienced walker knows not all walking surfaces are created equal where your joints are concerned.

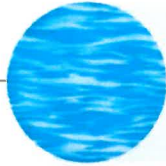
When it comes to choosing where you'll walk, you want to consider both terrain and texture, says Katy Bowman, MS, a biomechanist and co-creator of Walking Well. "The degree of incline or decline would be an example of terrain, and bumps are examples of texture," she explains. "Each combination of these moves uses different muscles."

Overall, it's a good idea to switch up your walking surfaces to get the most well-rounded body you can and prevent injury. "Just like being a good musician means being able to play lots of different pieces of music, a robust walker can cover many different textures and terrains," says Bowman.

Naturally, all walking surfaces have their pros and cons, but some are certainly easier on your body for everyday walking than others. Experts rank the most common surfaces from best to worst for varied workouts and keeping your joints healthy, along with what you need to know about each to make the most of your walks.

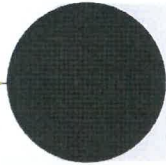
# BEST WALKING SURFACES FOR YOUR JOINTS **RANKED**

EASIEST



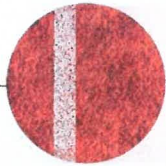
## 1 THE POOL

Water takes the most pressure off of joints.



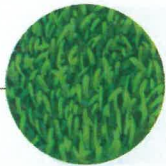
## 2 TREADMILL

The shock-absorbing cushion is easy on joints.



## 3 TRACK

This soft surface is flat and easy to track distance.



## 4 GRASS AND TURF

These surfaces are relatively soft and offer more variability.



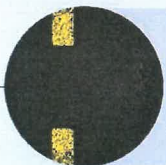
## 5 TRAILS

Depending on the trail's terrain, it can be harder or easier on your body.



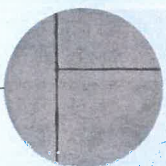
## 6 SAND

It may be soft but it's harder to walk on, requiring more muscle strength.



## 7 ASPHALT

Only slightly better than cement, it's hard on the joints.



## 8 CEMENT

This unforgiving surface is the worst for your joints.

HARDEST

## **THE POOL**

Pool walking ranks high among walking experts for its pros. “There are so many benefits of pool walking in helping someone meet their fitness goals, improve balance and gain body/joint range of motion,” says Donna Robertson, a teaching consultant for Foot Solutions and a board-certified pedorthist. This is partially due to the resistance water provides during movement, as well as buoyancy, which can aid in restoring postural balance while taking pressure off the joints.

The only downside here is the convenience factor. Some may not have access to a pool or may not feel like suiting up to get in the water. But experts agree it’s well worth the trouble.

## **TREADMILL**

There are many advantages to walking on a treadmill. “For those who are just beginning, or for those who are experiencing joint pain or are a little shaky on their feet, the best surface for you is the treadmill,” says Graca. “You have control over both your speed and intensity, and you can set a pace and incline you’re comfortable with.” Graca also points out that treadmills have rails you can grab onto if you’re feeling shaky or need support during your walk (although you shouldn’t get into the habit of doing so if you’re looking to maximize your calorie burn). Treadmills also have shock-absorbing technology, meaning your workout is lower-impact, and they allow you to get your walk in no matter the weather.

In terms of downsides, there are a couple. “Because of the propulsion of the treadmill belt, the machine is doing some of the work for you,” Taylor explains. “You may not be using all of your muscles to full capacity.” This can also affect your heel strike, she says, which may lead to knee problems for some people. Treadmills can also feel monotonous, and you might be less motivated to push yourself.

## **TRACK**

A track is a softer surface and therefore lower-impact on joints. “It’s an easy way to bust out some miles,” Bowman adds, especially since the standard track distance makes it simple to measure how far you’ve walked.

The cons, according to Bowman, are that depending on where your local track is, it may not always be available on school days, and tracks are very flat, so you don’t have the opportunity to vary your incline.

## **GRASS AND TURF**

“The pro of grass and turf is that this surface offers some degree of variability,” says Bowman. Because it’s a relatively soft surface, you’ll have to work slightly harder than you would otherwise, and it’s easier on your joints.

In terms of downsides, most grass and turf fields are flat, so you may miss out on the benefits of walking hills, Bowman points out. Grass may also be a poor choice for people who have balance issues or weak ankles due to the uneven surface. “Also note that if grass is wet, it can become slippery,” Taylor adds, which might increase risk of injury.

## **TRAILS**

“Trails are a natural surface that offer a high degree of variability, which can result in more body use,” says Bowman. Essentially, when your surface is varied, your body works harder. One study found walking on a surface that varied by only 2.5 cm (1 inch) from a flat smooth one resulted in an extra 28% increase in calorie-burning, adds Sarah Pelc Graca, a certified personal trainer.

“Plus, nature comes with its own nutrients,” Bowman says. The benefits of getting out in nature for your walk include lower stress levels, more energy and, often, a more intense workout. You can find trails suitable for all fitness levels, and it’s a great way to explore new areas to help you stay motivated.

Of course, all walking surfaces have their drawbacks, and trails are no exception. Some people may need to drive long distances to get to a trail, and weather might restrict your options. Also, because trails are likely to have a mixture of dirt, rocks and other materials, it’s important to stay alert about where you’re stepping to avoid injury.

## **SAND**

If you’ve ever gone for a stroll on the beach, you probably know how challenging walking in sand can be. “Walking through soft sand requires a lot more muscle strength and activation, resulting in quicker fatigue compared to walking on flat stable surfaces,” says Robertson. If you’re trying to get a quick workout, this can be a major advantage. Pro tip: If you’re walking on a beach, the sand furthest from the water will be driest and softest, and therefore most challenging to walk on.

On the flip side, the soft quality of sand can lead to injuries and strains, especially if you always walk barefoot, Robertson says. If you’re walking on the beach, it’s also important to keep the natural tilt of the terrain in mind, says Taylor. If you always walk in one direction, you may be getting an uneven workout, so it’s best to split your walk by walking in one direction, then turning around and walking in the opposite direction to balance things out.

## **ASPHALT**

Asphalt is a slightly better option than cement sidewalks, since it’s a bit more forgiving, Taylor says. It also has the benefit of being a smooth, even surface, provided the asphalt is in good condition.

However, it's still on the firmer side, which means it can be harsh on joints over time, especially if you tend to walk long distances.

## **CEMENT**

Cement sidewalks are generally flat and widely accessible, which can be helpful for people who have trouble with balance or are looking to go outside for a short walk.

The problem is “sidewalks made of cement have no elasticity,” says Jo Ann Taylor, co-founder and owner of The Walking Connection. “If you have joint issues, this can put undue stress on the knees, ankles and hips,” she says, especially if you walk on this surface regularly. If it can't be avoided, she recommends making sure your shoes have proper cushioning.

***To become more active, try setting a simple goal to increase (and track) your daily steps. Go to “Plans” in the MyFitnessPal app and choose a 28-day step plan to learn tips to boost your activity.***

# What Are the Benefits of Walking?



Written by [Jane Chertoff](#) on November 8, 2018



healthline

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## Is walking good for you?



Walking can offer numerous health benefits to people of all ages and fitness levels. It may also help prevent certain diseases and even prolong your life.

Walking is free to do and easy to fit into your daily routine. All you need to start walking is a sturdy pair of walking shoes.

Read on to learn about some of the benefits of walking.

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## 1. Burn calories


Walking can help you burn calories. Burning calories can help you maintain or [lose weight](#).

Your actual [calorie burn](#) will depend on several factors, including:

- walking speed
- distance covered
- terrain (you'll burn more calories walking uphill than you'll burn on a flat surface)
- your weight

You can determine your actual calorie burn through a [calorie calculator](#). For a general estimate, you can also refer to [this chart](#).

## 2. Strengthen the heart

Walking at least [30 minutes](#) a day, five days a week can reduce your risk for [coronary heart disease](#) by about [19 percent](#) . And your risk may reduce even more when you increase the duration or distance you walk per day.

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### 3. Can help lower your blood sugar

Taking a short walk after eating may help lower your blood sugar.

A [small study](#) found that taking a 15-minute walk three times a day (after breakfast, lunch, and dinner) improved blood sugar levels more than taking a 45-minute walk at another point during the day.

More research is needed to confirm these findings, though.

Consider making a post-meal walk a regular part of your routine. It can also help you fit exercise in throughout the day.

### 4. Eases joint pain

Walking can help protect the joints, including your knees and hips. That's because it helps lubricate and strengthen the muscles that support the joints.

Walking may also provide benefits for people living with arthritis, such as reducing pain. And walking [5 to 6 miles](#) a week may also help prevent arthritis.

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## 5. Boosts immune function

Walking may reduce your risk for developing a cold or the flu.

One [study](#) tracked 1,000 adults during flu season. Those who walked at a moderate pace for 30 to 45 minutes a day had 43 percent fewer sick days and fewer upper respiratory tract infections overall.

Their symptoms were also lessened if they did get sick. That was compared to adults in the study who were sedentary.

Try to get in a daily walk to experience these benefits. If you live in a cold climate, you can try to walk on a treadmill or around an indoor mall.

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## 6. Boost your energy

Going for a walk when you're tired may be a [more effective](#) energy boost than grabbing a cup of coffee.


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hormones that help elevate energy levels.

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## 7. Improve your mood

Walking can help your mental health. [Studies](#)  show it can help reduce anxiety, depression, and a negative mood. It can also boost self-esteem and reduce symptoms of social withdrawal.

To experience these benefits, aim for 30 minutes of brisk walking or other moderate intensity exercise three days a week. You can also break it up into three 10-minute walks.

## 8. Extend your life

Walking at a faster pace could extend your life. [Researchers](#) found that walking at an average pace compared to a slow pace resulted in a 20 percent reduced risk of overall death.

But walking at a brisk or fast pace (at least 4 miles per hour) reduced the risk by 24 percent. The study looked at the association of walking at a faster pace with factors like overall causes of death, cardiovascular disease, and death from cancer.

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## 9. Tone your legs

Walking can strengthen the muscles in your legs. To build up more strength, walk in a hilly area or on a treadmill with an incline. Or find routes with stairs.

Also trade off walking with other cross-training activities like cycling or jogging. You can also perform resistance exercises like squats, lunges, and leg curls to further tone and strengthen your leg muscles.

## 10. Creative thinking

Walking may help clear your head and help you think creatively.

A [study](#) that included four experiments compared people trying to think of new ideas while they were walking or sitting. Researchers found participants did better while walking, particularly while walking outdoors.

The researchers concluded that walking opens up a free flow of ideas and is a simple way to increase creativity and get physical activity at the same time.

Try to initiate a walking meeting with your colleagues the next time you're stuck on a problem at work.

## Tips for staying safe while walking

To ensure your safety while walking, follow these tips:

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- If you walk in the evening or early morning hours, wear a reflective vest or light so cars can see you.
- Wear [sturdy shoes](#) with good heel and arch support.
- Wear loose, comfortable clothing.
- Drink plenty of water before and after your walk to stay hydrated.
- Wear sunscreen to prevent sunburn, even on cloudy days.

## How to get started

To get started walking, all you'll need is a pair of sturdy walking shoes. Choose a walking route near your home. Or look for a scenic place to walk in your area, such as a trail or on the beach.

You can also recruit a friend or family member to walk with you and hold you accountable. Alternatively, you can add walking into your daily routine. Here are some ideas:

- If you commute, get off your bus or train one stop early and walk the rest of the way to work.
- Park farther away from your office than usual and walk to and from your car.
- Consider walking instead of driving when you run errands. You can complete your tasks and fit in exercise at the same time.

## The takeaway

Walking can fulfill daily recommended exercise for people of all ages and fitness levels.

Consider getting a pedometer or other fitness tracker to keep track of your daily steps. [Here are some to check out.](#)

Choose a walking route and daily step goal that's appropriate for your age and fitness level.

Warm and cool down before walking to avoid injury. Always speak to your doctor before starting a new fitness routine.

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Medically reviewed by [Daniel Bubnis, MS, NASM-CPT, NASE Level II-CSS](#)

The number of calories you burn while walking depends on different factors, including your weight, pace, terrain, and more.

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## Young of Heart, Fleet of Foot



JULIE JACOBSON/ASSOCIATED PRESS

**SENIOR GAMES:** Irma Bond, center, prepares for her heat of the 100-meter dash at the 2017 National Senior Games presented by Humana at Samford University in Birmingham, Ala. More than 10,500 athletes age 50 or older compete in the two-week event.