

**76th Annual Vermont Conference on Recreation
In Pursuit of Excellence**

“If Seniors Can Bike, Everyone Can Bike”



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Anne Lusk, Ph.D.

Research Scientist

Harvard T. H. Chan School of Public Health

Boston, Massachusetts

This is a topic deserving full consideration so the following will be addressed:

- 1. Where will seniors ride (safety is the number one concern for everyone) and When (with winter weather)?**
- 2. What bikes will seniors ride?**
- 3. Why will biking benefit seniors and everyone?**
- 4. How will creation of these bike facilities, bathrooms, etc., best occur, knowing of Climate Change?**

1. Where will seniors ride (safety is the number one concern for everyone) and When (with winter weather)?

The following is a description of the different bicycle facilities, users, safety, and other considerations.

MET

To understand the benefits of biking, here is a description of a **MET**, short for **metabolic equivalent of task**. This is similar to a measure for burning calories:

Sitting quietly – 1.0 MET (as all of you are)

Standing – 1.2 METs (as I am)

Driving – 2.0 METs

Sitting in a vehicle – 1.0 MET

Walking up stairs – 8.0 METs

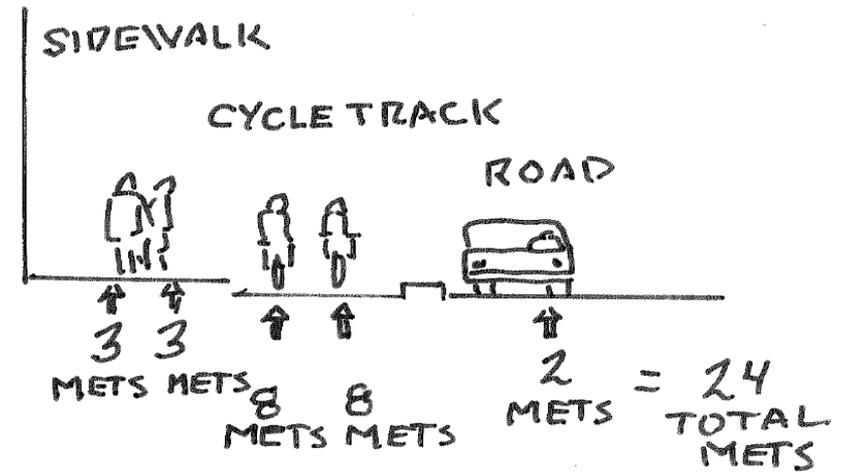
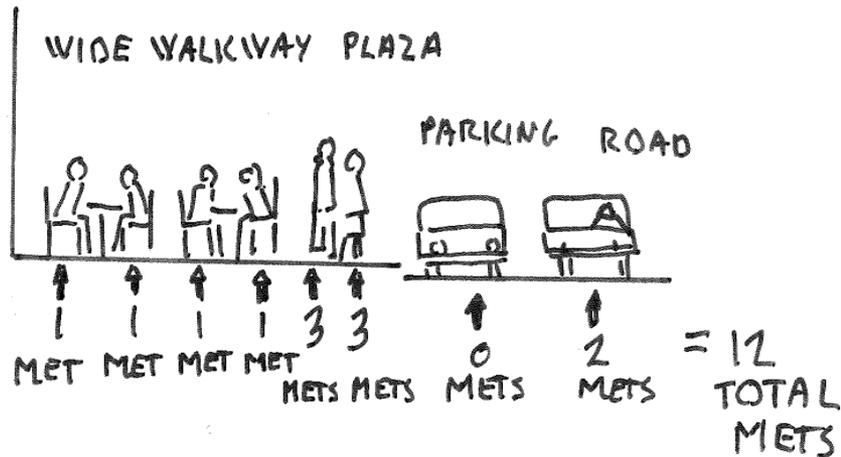
Walking down stairs – 3.0 METs

Slow walking 2.5 METs

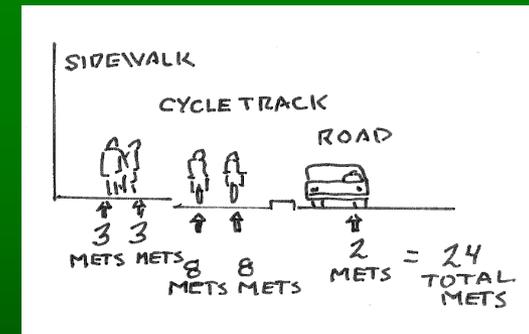
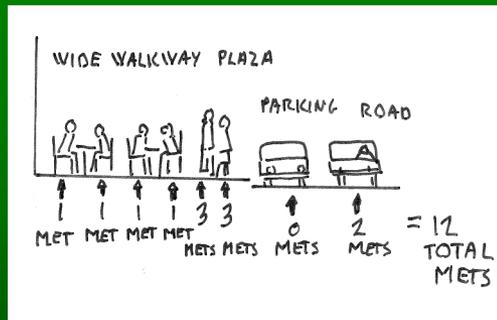
Brisk walking 3.3 METs

Bicycling average – 8.0 METs

The MET can be applied to cross sections of routes outside and inside buildings and called the “MET Route” (pretend there is a string from building front to building front capturing the METS).



The MET Route cross section measure can also be multiplied by time spent traveling:



12 METS x 10 MINUTES =
120 MET ROUTE MINUTES

24 METS x 10 MINUTES =
240 MET ROUTE MINUTES

For a “high” MET Route **cross section**, you want as many people bicycling side-by-side as possible because the METs from bicyclists are the highest (8 METs). If there are pedestrians, you also want them to walk as quickly as possible inside buildings and outside.

Therefore, you need to determine creative ways to **maximize the number of bicyclists and have pedestrians walk faster.**

So you know the vocabulary, here is a quick review of the facilities that can be considered as beneficial, or not, for METs in addition to buildings and sidewalks.

- 1) Road**
- 2) Bike lane beside parallel parked cars**
- 3) Bike lane not beside parallel parked cars**
- 4) Shared-use path**
- 5) Cycle track**
- 6) Advisory Bike Lane**
- 7) Mall, school, or office**

1) Road



- **Only 1% of U.S. population bicycles for transportation and only 24% are female. In the Netherlands, a cycle track is recommended on roads 50 mph (80 km). On Dutch 19 mph (30 km) roads, bicyclists share with cars and drivers are fined for harming a bicyclist.**
- **Drivers suffer from a syndrome called “looked-but-failed-to-see.”**
Herslund MB, Jorgensen NO. Looked-but-failed-to-see-errors in traffic. *Accid Anal Prev* 2003;35(6):885-91. Koustanai A, Boloix E, Van Elslande P, Bastien C. Statistical analysis of "looked-but-failed-to see" accidents: highlighting the involvement of two distinct mechanisms. *Accid Anal Prev* 2008;40(2):461-9.
- **Though research in Finland suggested that 11% of car drivers saw the bicyclist before crashing, 68% of bicyclists saw the car before a crash.**
Rasanen M, Summala H. Attention and expectation problems in bicycle-car collisions: an in-depth study. *Accid Anal Prev* 1998;30(5):657-66.

2) Bicycle lane beside parallel parked cars



- **Bicycle lanes can be double the risk for crashes from: a) “dooring;” and b) falling under passing vehicles.**
- **Boston bicycle messengers’ highest collision was vehicle (29%) and second dooring (16%).** Dennerlein JT, Meeker JD. Occupational injuries among Boston bicycle messengers. *Am J Ind Med* 2002;42(6):519-25
- **The Dutch have bicycle lanes but only if the cars are traveling between 19 mph (30 km) to 31 mph (50 km).**
- **Roads with bike lanes were safer for drivers and pedestrians but less safe for bicyclists.** Chen L, Chen C, Srinivasan R, McKnight CE, Ewing R, Roe M. Evaluating the Safety Effects of Bicycle Lanes in New York City. *Am J Public Health* 2012.

3) Bicycle lane not beside parallel parked cars



- Bicycle lanes are safer if they are not beside parallel parked cars.
- Cars sometimes park in the bicycle lane forcing the bicyclist to move into the car lane.
- A bicycle lane can be created to the left of a right turning car lane so the bicyclist is not “right hooked” by a turning car across the bicyclist’s forward-moving path.

4) Shared-use path



- Shared-use paths are paved two-way corridors shared by bicyclists, walkers, joggers, in-line skaters, baby-carriage pushers, and dog walkers.
- Some of the users complain about the other users (seniors suggest bicyclists are going too fast, etc.)
- In the Netherlands, the practice is to give bicyclists their own space with pedestrians beside them in their space.

5) Cycle Track



Photo Credit - aaron naparstek/streetsblog

<http://www.streetsblog.org/2006/11/06/cyclists-and-pedestrians-fighting-over-the-scrap/>

- **Cycle tracks are barrier-separated bicycle-exclusive corridors with parallel corridors for pedestrians.**

In Montreal, we compared vehicle/bicycle crash injuries on six cycle tracks (three above) with comparable reference streets without bicycle provisions. The cycle tracks had a 28% lower injury rate and 2.5 times as many bicyclists compared to the reference streets without bicycle provisions.

Lusk, A, Furth, P, Morency, P, Miranda-Moreno, L, Willett, W, Dennerlein, J. Risk of injury for bicycling on cycle tracks versus in the street. Injury Prevention. 2011; Feb 9 17: 131-135.

But what about socializing?

Don't create narrow cycle tracks. The cycle track needs to be wide enough for two bicyclists to bike side-by-side and to have another bicyclist pass.



http://www.cambridgema.gov/cdd/et/infra/western/western_concept_book.pdf



<http://www.streetsblog.org/2006/11/06/cyclists-and-pedestrians-fighting-over-the-scrap/>

6) Advisory Bike Lanes



<http://www.cbc.ca/news/canada/ottawa/advisory-bike-lanes-ottawa-1.3808844>



Photo: Portland Bureau of Transportation via [Bike Portland](#)

An Advisory Bike Lane (ABL) means the drivers encroach on the space for bicyclists. This works in the Netherlands where almost all drivers are or have been bicyclists but in the U.S. many drivers might double park in the ABL. This could work in senior residential communities where driving speeds are 10 MPH.

Buy what about bad weather?



<https://www.cbc.ca/news/canada/calgary/winter-biking-cycling-cold-weather-stay-safe-calgary-1.4389551>

People in cars or transit are comfortable but people outside have to deal with the weather.

7) Biking inside shopping malls, schools, and offices off hours



<https://kotaku.com/abandoned-malls-look-like-sad-empty-video-games-1562055109>

Malls are going out of business and yet, for Climate Change, we should consider retrofitting and not demolishing them. Some malls are incorporating gyms and offices. We could allow three wheeled bikes (stable) for winter biking in the hallways. We could also have hallway biking in large schools and offices after hours because the buildings are always heated and have lighting.

Include other features on the bike routes:

Bicycle traffic signals at intersections



Hangzhou, China has an extensive network of cycle tracks and 53.9% of the men and 60.2% of the women preferred cycle tracks to the other bike environments.

Hangzhou also has bicycle signals and 63.7% of the men and 69.1% of the women preferred having the bicycle signal.

Lusk, A, Wen, X, Zhou, L. Gender and Used/Preferred Differences on Bicycle Routes, Parking, Intersection Signals, and Bicycle Type: Professional Middle Class Preferences in Hangzhou, China. *Journal of Transport and Health*. 2014; 1: 124-133.

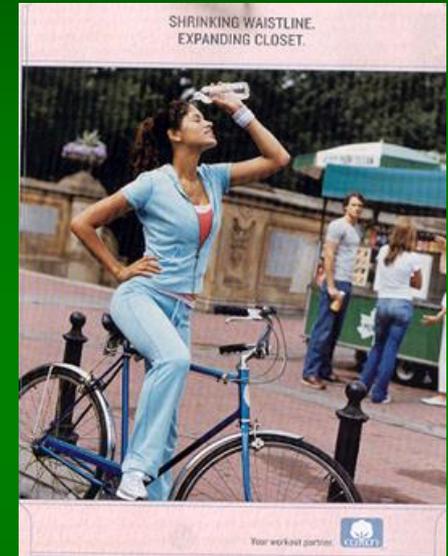
Include other features on the bike routes:

Consider stencils for wayfinding instead of only signs. Seniors and others don't want to be confused about which way to travel. These stencils could include graphics for a nearby bathroom or coffee shop and the distance to travel.



Include other features on the bike route:

Always have water available



Water fountains should be readily available along the Climate Change Cycle Tracks and designed for ease in filling water bottles.

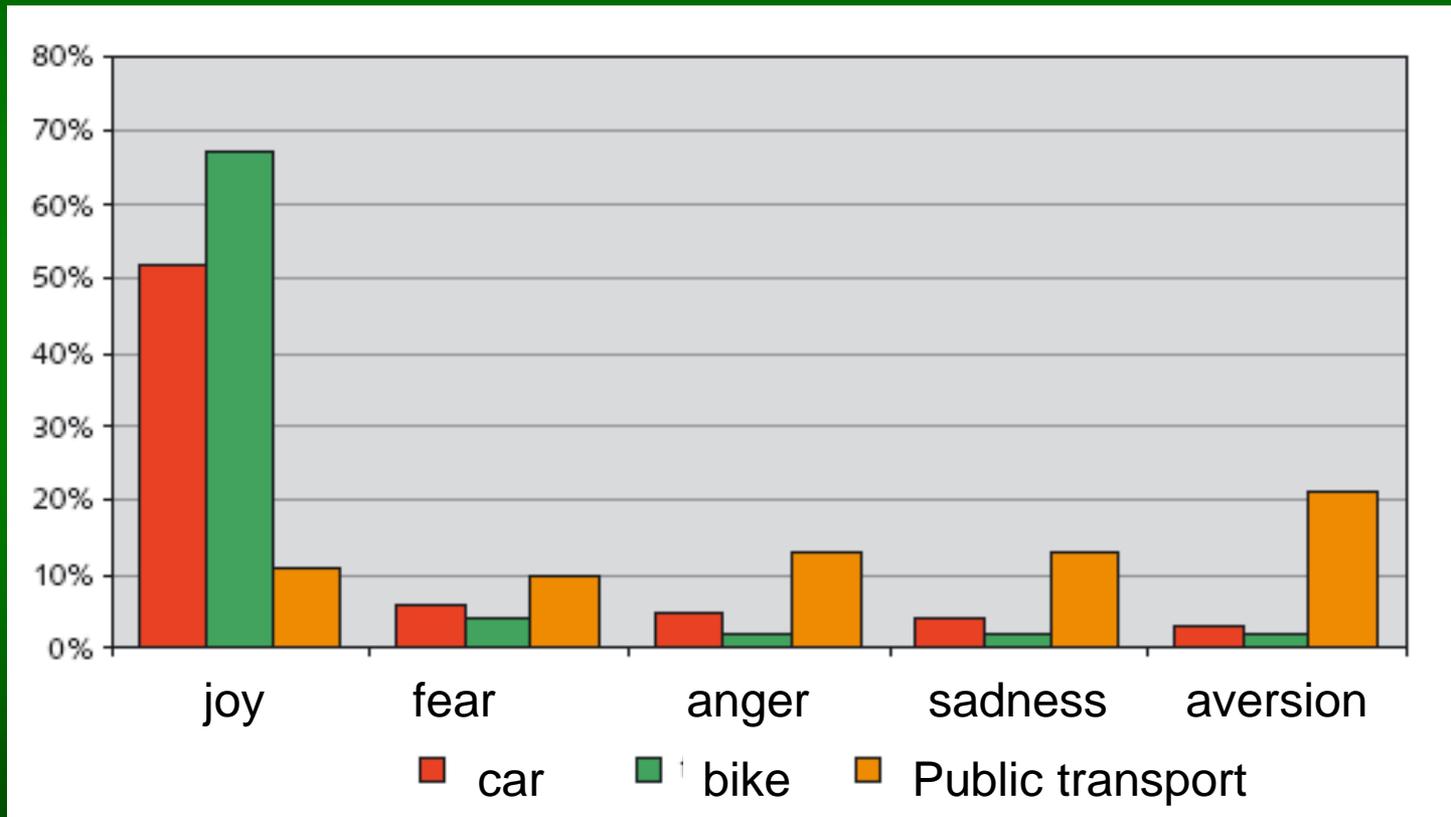
Include other features on the bike routes:

Incorporate “Social Bridges” or elements in the built environment that facilitate a positive interaction between strangers. There are 5 types of social bridges that could be included to lessen senior’s isolation and depression.



Joy and “Social Bridges” Research

Incorporating Joy and Social Bridges in the built environment might increase overall METs.



From Knowledge Institute Mobility, 2007 The Netherlands

Joy and “Social Bridges” Research

Assist Social Bridge

An “assist” social bridge is when the environment provides the opportunity to help someone else.

A door is a simple social bridge that you can open for someone else.



Velib enables flirting.



Joy and “Social Bridges” Research

Connect Social Bridge

A “connect” social bridge is based on William Whyte’s triangulation in which a third phenomenon enables a connection between two strangers. The connection is made with another person through speech, eye contact, or a smile. The shared fun of ice cream is a connect Social Bridge.



Joy and “Social Bridges” Research

Observe Social Bridge

An “observe” social bridge is when a person is witness to the deed, smile, or even warm eye glance between people.



Joy and “Social Bridges” Research

In Absentia Social Bridge

An “in absentia” social bridge is when the participant in the space is aware that another individual created the space for their use or pleasure.



Joy and “Social Bridges” Research

Information Social Bridge

An “information” social bridge is when information is provided by an individual. The provider of the information might not even be there but their presence is felt as helping.



2. What bikes will seniors ride?

The following is a description of the different types of bike and the users.

All bikes are not just two wheels or adult tricycles (which can tip)

Seniors often are told not to drive and to take transit, walk, or be driven. If they biked, they would be independent and healthier. There are age-friendly Dutch bikes.



Balance Bike



Easy Rider



Fun2Go

On these a senior is stable and can ride with a friend or grandchildren



3. Why will biking benefit seniors and everyone?

The following is a description of the benefits for seniors and everyone to bike.

For health – Bike:

Commuting by biking was associated with a lower risk of cancer, all cause mortality, and cardiovascular disease.

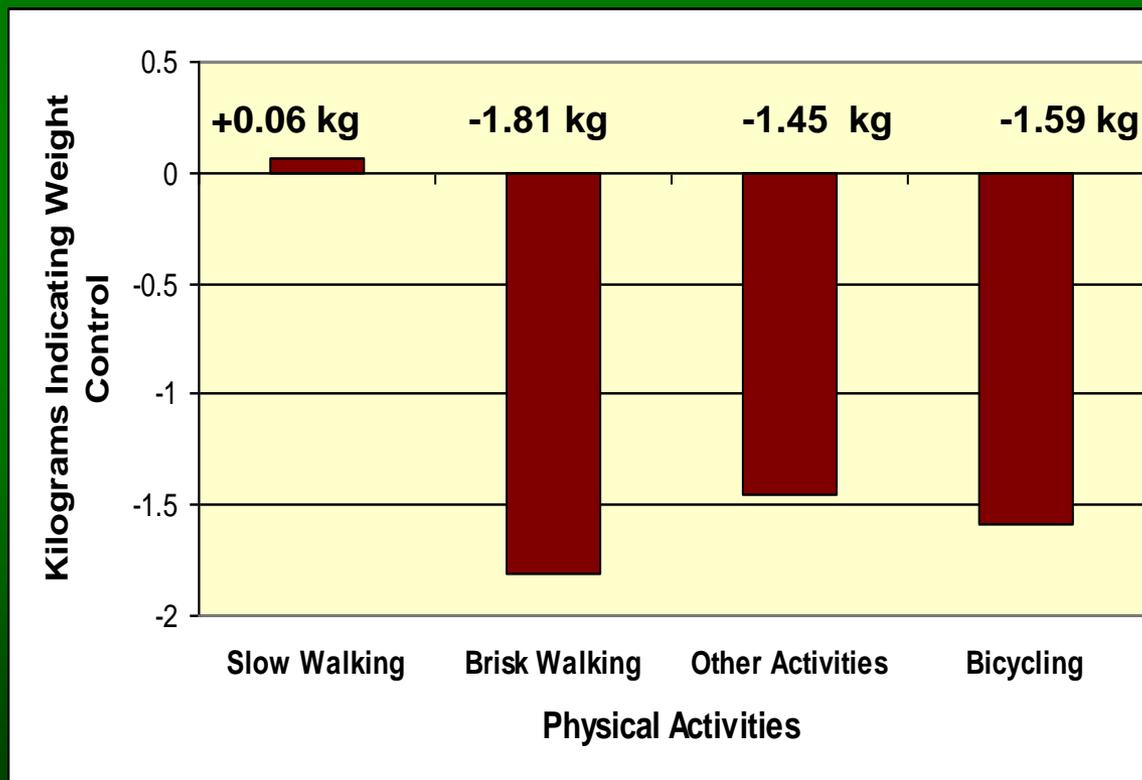


Commuting by walking was only associated with a lower risk of cardiovascular disease.

For weight control - Bike

In research conducted on 18,414 nurses in the Nurses' Health Study II, 50 % of the women walked slowly and slow walking did not control weight.

Lusk, A,* Mekary, R,* Feskanich, D, Willett, W. Bicycle Riding, Walking, and Weight Gain in Premenopausal Women. Archives of Internal Medicine. 2010; Vol 170 (no. 12) June 28: 1050 -1056.



For weight control – Keep Biking

In research conducted on 18,414 nurses in the Nurses' Health Study II, if women did not bicycle in 1989 but bicycled in 2005 for a set time, they were more likely to have controlled weight. A dose response also exists, i.e., more bicycling = more weight control and less bicycling = more weight gain.

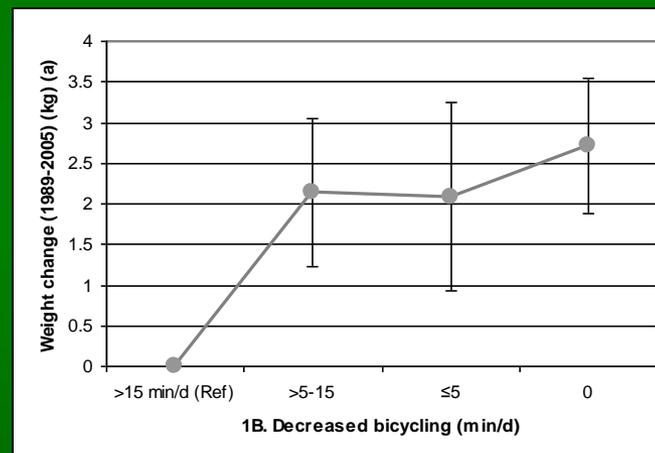
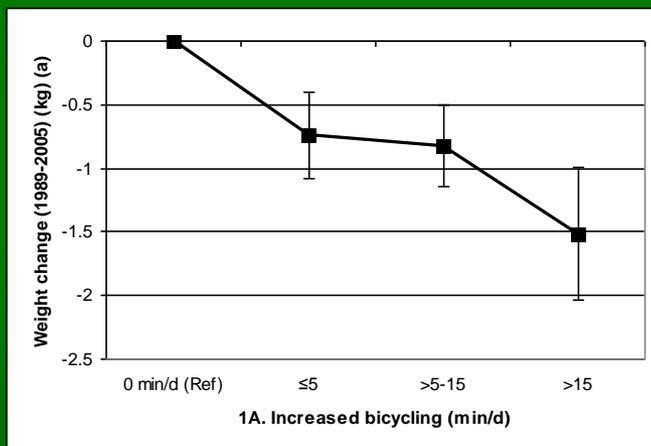


Figure 1A includes only women who did not initially bicycle (0 min/d) at baseline (1989). The figure reflects the slope of weight change if women remained in the non-bicycling category in 2005 or if they increased their bicycling in 2005. Figure 1B includes only women who initially bicycled for >15 min/d at baseline (1989). The figure reflects the slope of weight change if women remained in the high bicycling activity category in 2005 (reference), or if they decreased their bicycling in 2005.

Lusk et al., (2010) "Bicycle Riding, Walking and Weight Gain in Premenopausal Women" Archives of Internal Medicine June 28:170(12):1050-1056 <http://archinte.ama-assn.org/cgi/reprint/170/12/1050>

For cognitive functioning - Bike:

To lower the risk of dementia or Alzheimer's, the following are recommended:

- 1) Maintain good hearing
- 2) Have secondary education
- 3) Not smoke
- 4) Reduce depression
- 5) Exercise
- 6) Engage in social activity
- 7) Treat high blood pressure
- 8) Have a healthy weight
- 9) Treat Type 2 diabetes

While biking can't address the first three, biking can address the last six.



For leg power and Alzheimer's - Bike

- “Interventions targeted to improve leg power in the long term may help reach a universal goal of **healthy cognitive aging**.”
- Exercise has been shown to **reduce the risk of Alzheimer's and dementia**.



<https://bikesreviewed.com/fun/senior-bike-riding/>

Stevens CJ, Mehta MM, Jackson SH, Spector TD. Kicking Back Cognitive Ageing: Leg Power Predicts Cognitive Ageing after Ten Years in Older Female Twins. *Gerontology* 2016;62:138-49.

Hamer M, Chida Y. Physical activity and risk of neurodegenerative disease: a systematic review of prospective evidence. *Psychological medicine* 2009;39:3-11.

For brain protection - Bike

- Active lifestyles are more **protective against Alzheimer's** than cognitive or physical training (as typically conducted, i.e., endurance, flexibility, balance, etc.).
- Physical activity, and not social activities, was associated with **protection of cognitive abilities**.



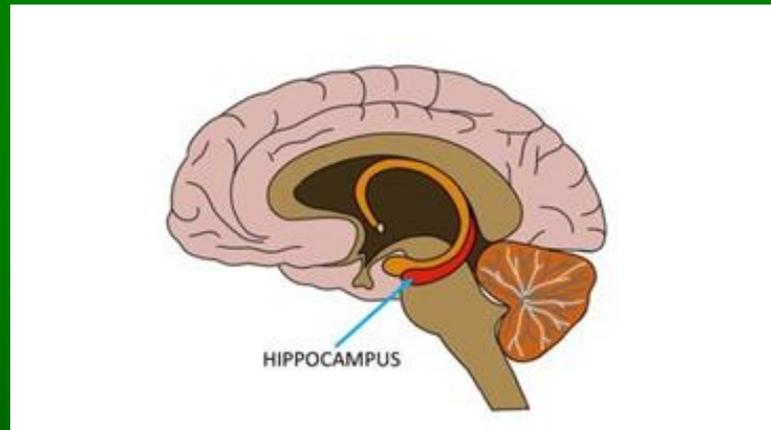
<http://usa.streetsblog.org/2014/06/20/surprise-people-aged-60-79-are-leading-the-biking-boom/>

Kuster OC, Fissler P, Laptinskaya D, et al. Cognitive change is more positively associated with an active lifestyle than with training interventions in older adults at risk of dementia: a controlled interventional clinical trial. *BMC Psychiatry*. 2016;16(1):315.

Lam LC, Ong PA, Dikot Y, et al. Intellectual and physical activities, but not social activities, are associated with better global cognition: a multi-site evaluation of the cognition and lifestyle activity study for seniors in Asia (CLASSA). *Age Ageing*. 2015;44(5):835-840.

For hippocampus volume - Bike

- Biking is beneficial for **dementia and Alzheimer's** because it pumps blood to the brain and grows the hippocampus, an organ associated with memory. Aerobic exercise revealed changes in cardiovascular fitness which positively impacted hippocampal volume and memory.



<https://www.neuroscientificallychallenged.com/blog/2014/5/23/know-your-brain-hippocampus>

Morris JK, Vidoni ED, Johnson DK, et al. Aerobic exercise for Alzheimer's disease: A randomized controlled pilot trial. PloS one. 2017;12(2):e0170547.

For other benefits - Bike



- Seniors who biked for one hour a week showed significant improvements in **balance and timed-leg standing**.
- Seniors (aged 50-75) in a 12 week bicycling program showed improved **quality of life and health**.
- Biking lowers risk of depression.

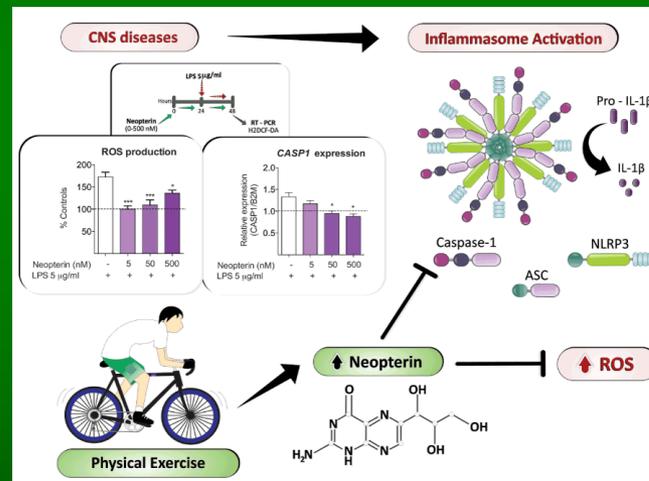
Rissel, C., E. Passmore, C. Mason and D. Merom (2013). "Two pilot studies of the effect of bicycling on balance and leg strength among older adults." J Environ Public Health 2013: 686412.

Zander, A., E. Passmore, C. Mason and C. Rissel (2013). "Joy, exercise, enjoyment, getting out: a qualitative study of older people's experience of cycling in Sydney, Australia." J Environ Public Health 2013: 547453.

Whitaker, E. D. (2005). "The bicycle makes the eyes smile: exercise, aging, and psychophysical well-being in older Italian cyclists." Med Anthropol 24(1): 1-43

Biking would also benefit everyone because Alzheimer's starts years before expression

- Alzheimer's (and depression) may be prevented by engaging in moderate intensity physical activity earlier in life. Moderate exercise reduces activation of the NLRP3 gene which is associated with inflammation in the brain.



<https://www.oatext.com/Treating-depression-with-exercise-The-inflammasome-inhibition-perspective.php>

Abkenar, I, Rahmani-nia, Lonbrdi, G. (2019) "The Effects of Acute and Chronic Aerobic Activity on the Signaling Pathway of the Inflammasome NLRPE Complex in Young Men." *Medicina* 55.

Martins, R, Lin, C, Ghisoni, K, et al., (2016) "Treating depression with exercise: The inflammasome inhibition perspective." *Journal of Systems and Integrative Neuroscience*. Vol 3(1) 1-8.

4. How will creation of these bike facilities, bathrooms, etc., best occur, knowing of Climate Change?

The following is a focus on how we create these bike environments and how they respond to Climate Change.

1. Change from the public participation process.

In a study in 2004, the authors concluded that the public participation process caused anger and mistrust. In 2015, transportation engineers are still using the same antiquated public participation by presenting their Power Points to citizens in the audience. Citizens can only comment.



2. Have citizens give the Power Points.

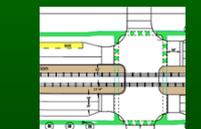
On December 3rd, 2014, citizen groups presented their own Power Points in Brookline to Town officials, engineers, MassDOT, and Toole Design:

- Brookline High School parents
- Brookline Lincoln Elementary School parents
- Seniors
- Representatives from a community group
- Boston Cyclist Union
- Brookline Bicycle Advisory Committee



On December 9th, 2014, citizen groups presented their own Power Points in Allston about Com Ave to officials, engineers, and MassDOT:

- Boston Cyclist Union
- WalkBoston
- LivableStreets
- MassBike



The citizens got their requested cycle tracks.

3. Have citizens initiate the policy changes.

Citizens with the Cambridge (MA) Bike Safety group proposed a new law which was approved:

“This week, the Boston suburb of Cambridge mandated that protected cycling lanes be installed on all streets that are slated for reconstruction under existing city plans.

Passed by the city council on April 8, the ordinance appears to be the first of its kind in the U.S., and allows Cambridge—a dense university town that already has an unusually high share of bike commuters—to ascend into the ranks of the most progressive bicycling cities in the country. Local law now requires the city to erect vertical barriers between cyclists and cars on any roadway that’s rebuilt, expanded, or reconfigured if it’s part of the proposed 20-mile network of separated lanes known as the Cambridge Bicycle Plan. Only in “rare circumstances” where the city manager must cite physical or financial restraints will there be exceptions.”

4. Have officials apply Physical Determinism

The Social Reform Movement of the late 19th Century was based on “Physical Determinism” or government officials providing environments that foster health and safety. The Dutch have recently removed parked cars.



[New York, We Are on Our Way!history591seventeen.wordpress.com](https://www.history591seventeen.wordpress.com)

Jacob Riis wrote [How the Other Half Lives](#) (1890) and depicted the overcrowding in places including New York City (tenement housing – more crowded and unsanitary than Bombay).



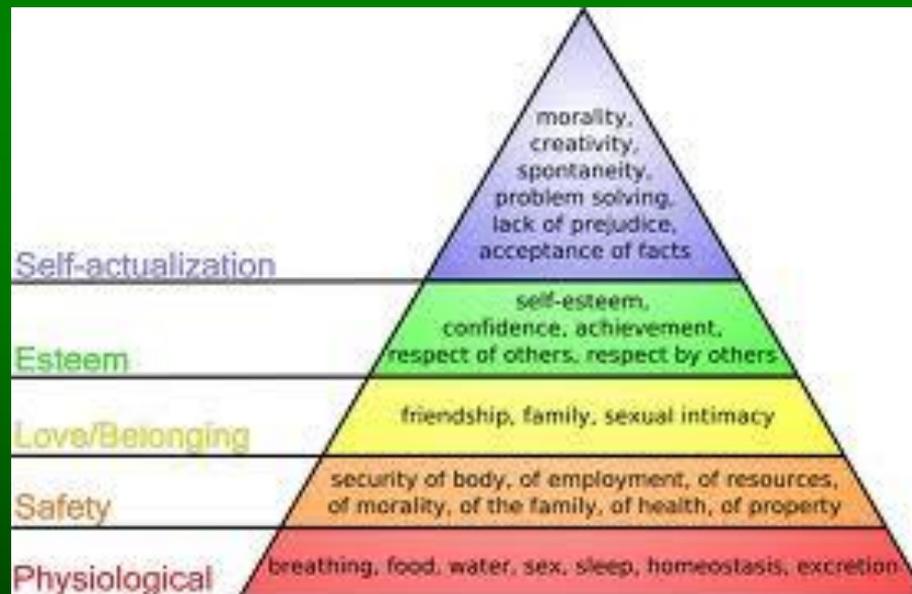
<https://www.citylab.com/transportation/2019/06/amsterdam-parking-spots-removal-cars-bikes-parks-playground/591067/>

The Dutch moved parallel parked cars to nearby parking garages and replaced the cars with gardens, playgrounds, and bike parking.

5. Utilize measures from Maslow's Hierarchy of Needs for a transportation Level of Service

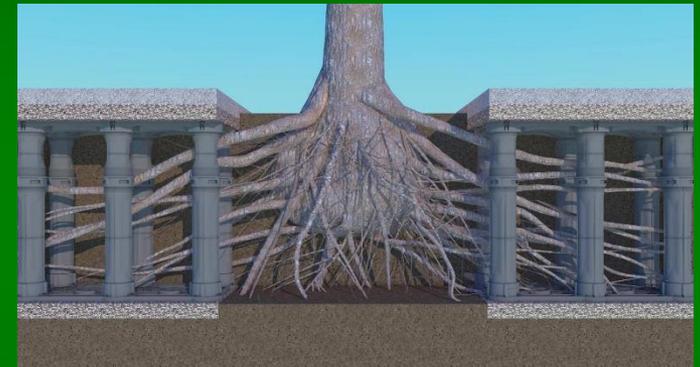
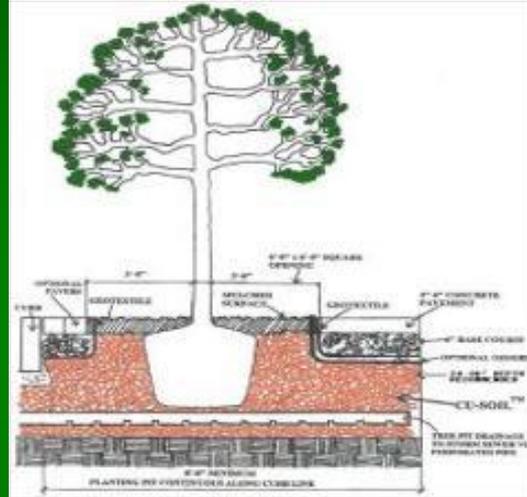
In transportation, after meeting lower needs of safety and security, higher needs should be met of comfort and convenience.

Winters, P.; Tucker, L., Creative Solutions for Assessing Level of Service Equally Across Modes. *Transportation Research Record: Journal of the Transportation Research Board* **2004**, 1883, 185-191



[File:Maslow's hierarchy of needs.png – Wikimedia Commonscommons.wikimedia.org](#)

6. Plant trees to guarantee full maturity.



<http://www.urbanreviewstl.com/2013/5/street-trees-must-be-planted-deep-enough-the-root-ball-wont-dry-out/>

Structural Soil

<http://www.tmtenterprises.net/product-structural.php>

Silva Cells

<https://enrichmond.org/2018/05/silva-cell-installation-in-progress-at-17th-street-market/>

Trees cool a city and enhance the bike/ped environment but often are planted in less than ideal conditions. Trees could be planted with structural soil or Silva cells to thrive.

7. Plant trees in pits so roots talk and trees are healthier.



In Research conducted on 5 cycle tracks in Boston, pedestrians and bicyclists preferred to have trees and bushes between the cars and the cycle track compared with having trees between the sidewalk and the cycle track.

Lusk, A. Dobbert, L. Tree location preferences on cycle tracks relative to sidewalks and the thermal advantages of finding a place for the trees.

8. Have irrigation systems so the trees thrive.



If trees can receive water from un-compacted soil and an underground water storage system, the bikable surface is larger.

9. Stack cars in garages instead of parking them on the side of the road and provide electric recharging.

Cities used to have small garages and “parking houses” or “parking coops on small lots” could provide alternatives to the side of the road storage of cars.



<https://www.cleaneconomy.com/clients/ev-charging-stations-condos-and-apartments/>

10. Create Climate Change streets with Bus Rapid Transit (BRT), cycle tracks, and trees.

With cars in garages, the side of the road can be for Bus Rapid Transit, wide cycle tracks, and trees. The best design elements for trees, cycle tracks, and bus rapid transit could mitigate Climate Change.



**How would you design the built environment
for seniors and everyone to bike?**



**Thank you
Anne Lusk, Ph.D.
AnneLusk@hsph.harvard.edu**