Quantifying Footwear-Generated Microplastics

**the goals**

1. How much microplastic comes off of shoe outsoles?
2. Which outsole characteristics contribute to the most wear loss?

**the microplastic problem**

Common microplastic sources

Microplastic released into environment

Ecosystem disruption

Plastic is everywhere and we use it a lot. The average American is estimated to consume about 300 lbs of plastic every year! [1] These plastics break down and release "microplastics" which persists in the environment and are extremely difficult to remove. These tiny particles range from 0.05 - 5 millimetres in length. Although their total impact has not been fully assessed, studies have found them nearly everywhere on the planet. Their presence has been linked to a host of environmental problems including ecosystem disruption as well as human health problems including immune cell damage. [2,3]

Previous estimates have relied largely on soil and water samples to trace microplastics back to their origins, and have consistently identified footwear outsoles as one prominent contributor to the total microplastic generation alongside other common sources such as car tires, city dust, and artificial turf. However the estimates for the amount of microplastic generation from footwear are varied widely with the method system

**the findings**

- Rubber hardness, outsole geometry, and rubber material did not have a significant impact on shoe wear.
- Rate of microplastic shedding decreased as the distance traveled increased.
- The first rate of microplastic loss from real shoe wear estimates are shown below, along with comparisons from previous studies.

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**the data**

**1.4 - 40.0**

grams of microplastic generated/person/year based on our wear test

**as compared to...**

**17 - 175**

grams of microplastic generated/person/year based on Lassen’s estimate (2015)

**8,900 - 400,000**

metric tons of microplastic generated globally/year from footwear based on our wear test estimate which is the same as...

1 to 28

large garbage trucks

**28**

志愿者 for contributing their time.

**final thoughts**

Our project highlights significant discrepancies in existing assessments of footwear-based microplastic generation. The results suggest that there seems to be significantly less microplastic stemming from shoe outsoles than previously estimated. This was most likely caused by other microplastic sources that we were unable to identify.

While this project provides an in-depth exploration of everyday footwear outsole loss, there were several limitations associated with our evaluation such as the reliability of self-reported data from wear testers, not having comparable values from controlled environments, the lack of understanding of weather conditions and strain during wear use, the short length of our wear test, and the uncertainty around our parameters during our global extrapolation. Future research can be conducted to further explore footwear’s contribution to microplastic generation.

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The Future Footwear Project
Quantifying Footwear-Generated Microplastics

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Use the QR code or url below to check out the whole project:

www.futurefootwearproject.com