

**Effects of Solar Radiation in the Streets  
on Pedestrian Route Choices in Cities**

**January 2024**

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A Dissertation Submitted to  
the Graduate School of Life and Environmental Sciences,  
the University of Tsukuba  
in Partial Fulfillment of the Requirements  
for the Degree of Doctor of Philosophy in Science  
(Doctoral Program in Geoenvironmental Sciences)

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## **Abstract**

An existing hypothesis states that under severely hot and cold weather conditions, pedestrians may choose routes based on the presence or absence of solar radiation. However, this hypothesis has not yet to be verified. Therefore, the present study aims to experimentally clarify the effects of solar radiation in the streets on pedestrian route choices. In the experiment, 19 participants walked freely from a starting point to a designated destination on a sunny summer day (August 2, 2019). The participants were also asked to explain their route choices at each diverging point during their walk. The most common reason given was “because there is shade” (28.2%), indicating that the presence of shade is a major factor in route choice under hot weather conditions. The questionnaire survey conducted after the walk revealed that many of the participants considered the presence of shade mainly to protect their health and thereby avoid conditions such as heat stroke and sunburn. In summary, the participants’ choice of shaded routes indicates their awareness of the dangers of solar radiation and their defensive motivation to avoid it.

In another experiment conducted under cold weather conditions (February 4, 2020), “because it is the shortest route” was the most common reason (22.7%) given by the participants while “because there is solar radiation” was rarely uttered. Such results indicate the minimal effect of solar radiation on route choice in a low-temperature environment during winter. Moreover, the defensive motivation of the participants in the summer experiment did not seem to emerge in the winter experiment. In addition to the fact that the temperature during the winter experiment was not remarkably cold (10 °C), the participants’ bodies were warmed up by the walking activities while wearing heavy clothing. Therefore, the participants did not need to actively choose roads in the sun,

and reasons other than the presence or absence of solar radiation were considered as primary factors.

Clarifying the effects of solar radiation on pedestrian route choice and the reasons for pedestrians' choice of shaded areas will be beneficial for building design and urban planning.

Keywords: route choice; outdoor thermal environment; pedestrian; solar radiation