

Analysis of Factors Influencing Pedestrian Excursion Behavior

~Focusing on Actual-to-Shortest Travel Time Ratio~



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1. Background

■ Promotion of “Walkable City”

- Promoted by MLIT to enhance public health and revitalize city centers.

ex. Redevelopment of Ropeway Street in Matsuyama City



- Further study is required on what factors motivate people to take excursions in urban areas.

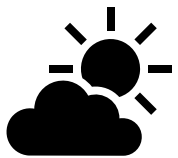
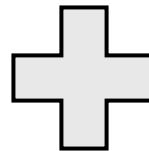
Objective

1. Identify the factors that encourage excursions
2. Propose solutions to create excursion-friendly streets

2. Data

- 2021 Toyosu PP Survey
 - Extracted walking trip data for leisure purposes to focus on pedestrian excursion behavior.
 - Defined the following as the excursion indicator.

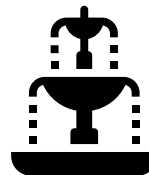
Excursion indicator = Actual Travel Time / Shortest Routed Travel Time



Weather



Traffic signals



Waterfronts



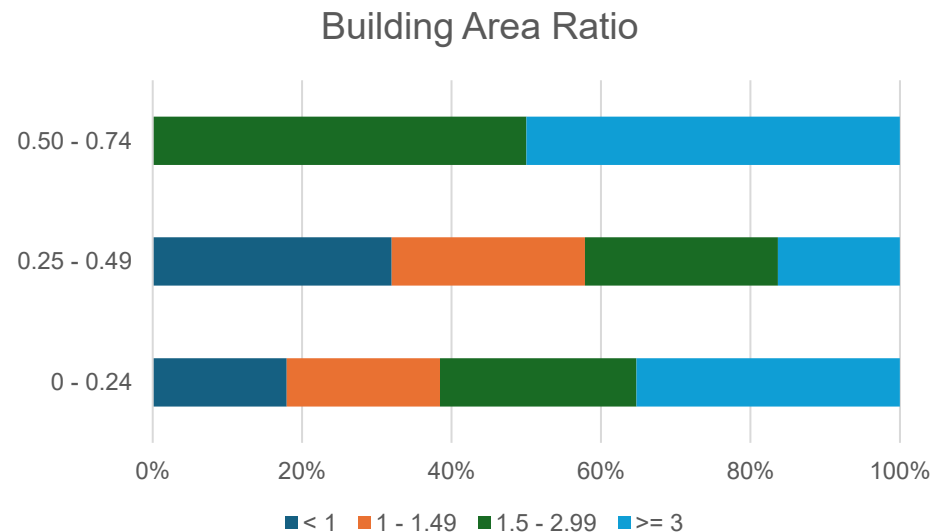
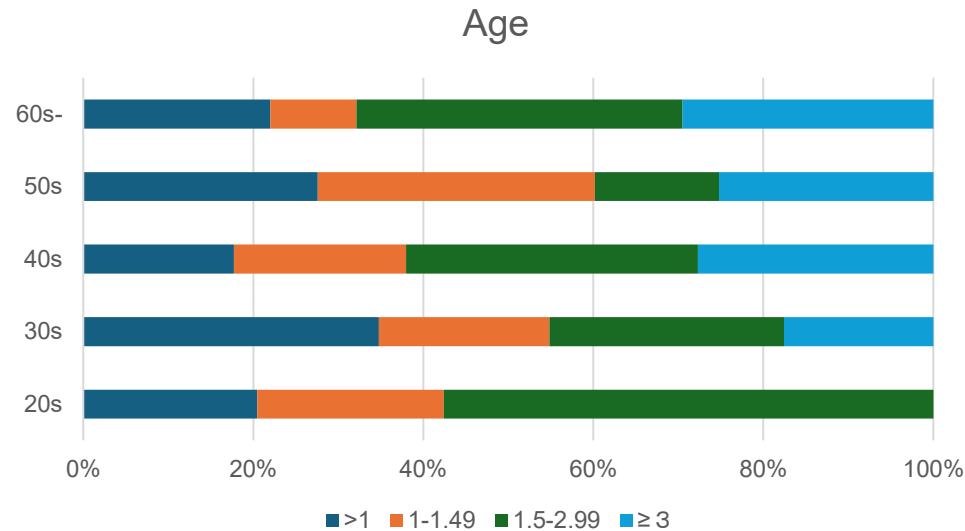
Green spaces



Restaurants

etc.

3. Descriptive Statistics



4. Modeling

■ Multiple Regression Analysis

$$y = \mathbf{X}\boldsymbol{\beta} + \varepsilon$$

Objective Variable : Excursion indicator
(= Actual Travel Time / Shortest Routed Travel Time)

Explanatory Variable : [Personal Attributes]
Age, Gender, Occupation, Having Children etc.

[Trip Purpose]
Park, Sport, Commercial etc.

[Situational Factors]
Weather, Time of Day, Holiday etc.

[Shortest Path Characteristics]
Distance, Signal, Store, Waterfront, Green Area etc.

5. Result

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Variables		Estimate	t-value
Constant		0.71	1.22
Personal Attributes	Having Children	-0.44	-2.23**
	Bicycle Ownership	0.58	2.51**
Trip Purpose	Park	1.48	3.51***
	Commercial Facility	0.72	2.16**
	Sport Facility	-0.89	-2.57**
Situational Factors	Max Temperature (°C)	-2.64×10^{-2}	-1.92*
	16:00-19:00 dummy	-0.54	-2.72***
Shortest Path Characteristics	ln(Shortest Path Distance) (m)	-0.32	-3.38***
	Traffic Signal Density (/km)	6.31×10^{-3}	2.86***
	ln(Ratio of Low-Speed Roads ($\leq 30\text{km/h}$)) (%)	-5.37×10^{-2}	-1.93**
	ln(Building Area Ratio) (%)	-0.36	-2.21**
	ln(Green Space Area Ratio) (%)	-8.75×10^{-2}	-1.64*
	(Bench/Rest Spot Density)**2 (/km)	2.00×10^{-2}	2.69***
	Street Tree Density (/km)	9.87×10^{-3}	2.78***
	Convenience Store Density (/km)	2.11×10^{-2}	1.69*
Sample		305	
R-squared		0.362	
Adjusted R-squared		0.329	

6. Summary

- Providing spatial margin in urban areas suggests the potential to encourage longer-duration excursions.
 - Current approaches in walkable city design, such as lane reductions and road widening are considered effective.
- A decrease in street tree density was suggested to reduce pedestrian excursion tendency.
 - While the Tokyo Metropolitan Government has recently been felling street trees for cost and management reasons, this may be undesirable from the perspective of urban excursion.
- No relationship was found with behaviors occurring before or after the excursion behavior.
- Parameters estimated as statistically significant in this study are speculated to serve as influential factors in route choice models as well.

Thank you!