

# SUMMARY

of the dissertation by Caroline Koszowski, M.Sc.

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## **Pedestrian activities: Enhancing knowledge and visibility of walking and place activities**

Walking promotes sustainable urban and transport development and a healthy society. Together with place activities in public spaces (e.g., chatting, outdoor dining), pedestrian activities enhance the livability and vitality of streets. In addition, in Household Travel Surveys (HTS), walking appears consistently as a significant and stable component of urban transport. For these reasons, it is essential to elevate the visibility and understanding of pedestrian activities, both as a driver of urban vitality and as a key element in transport systems.

Despite the multiple benefits of pedestrian activities, significant gaps in knowledge and visibility persist:

- Trip-based HTS, such as the German city-based HTS SrV, collect data on the travel behavior of individuals on their daily trips mainly on trip level and thus generate trip-based modal-split figures. Working with HTS mobility data, it can be assumed that especially walking stages of intermodal trips are often hidden in trip-level data. This limited visibility of walking in intermodal trips in data may lead to underestimation of its importance as a transport mode. This raises the research question of how the visibility of walking stages can be increased in HTS? Is it possible to develop a methodology to generate stage information from trip-level HTS? If yes, what input data are required?
- Considering the limited visibility of walking stages in intermodal trips, it is equally important to examine how place activities integrate into and influence travel behavior. Place activities can either occur at destinations of trips (e.g., dining outside) or during trips (e.g., waiting at the bus stop). The existing definitions and terminology from the field of HTS only partially cover the mentioned types of place activities. This raises the research question of how these terms and definitions can be harmonized and consistently be linked.
- In addition, extensive studies on place activities from the transport planning perspective and in European context are still missing. This means, typical key characteristics of place activities, such as their duration, variation across different times of day, and differences by gender and age as well as correlates of street design, have not yet been adequately investigated. This leads to the research questions: What are the characteristics of place activities in general? How do place activities vary throughout the day? What are the characteristics of place activities by gender and age groups? What are the relationships between street characteristics and place activities?
- There is a lack of knowledge on context-specific motivating or hindering determinants walking, which could serve as a bridge between the individual and the street level. This raises the research question of which context-specific factors at the neighborhood and streetscape level correlate with leisure and utilitarian walking? Are there differences between frequent and less frequent walkers?

This thesis aims to shed light on the field of pedestrian activities and raise awareness of its importance within the transport planning community. Hence, this thesis presents three papers that collectively adopt a multi-data and multi-method approach to deepen insights into mobility and street user behavior.

Paper 1 identifies context-specific determinants for the frequency of walking for leisure and utilitarian purpose at the individual, neighborhood and street level. The results are representative for German cities with at least 100,000 inhabitants. By using Logistic Regression Models and additional descriptive analysis, the paper focuses on walking as an integral part of pedestrian activities.

**Highlights of Paper 1 and main contributions:**

- *Identification of context-specific determinants at individual, neighborhood, and street level.*
- *Provision of representative results for German cities with at least 100,000 inhabitants.*
- *Emphasis on distance as a key determinant for the frequency of utilitarian walking.*
- *Demonstration of a higher relevance of built-environment characteristics for the frequency of leisure walking compared to utilitarian.*

Paper 2 is positioned at the individual level, aiming to develop a new methodology for generating stage information from trip-level HTS for German cities with at least 100,000 inhabitants, specifically focusing on inner-city trips. The methodology is based on two German HTS datasets (SrV 2018 and MiD 2017) and encompasses four steps: (1) calculation of the number of stages of all trips in SrV 2018, (2) estimation of the duration of walking stages in intermodal PT and car trips in MiD 2017 and the transfer to SrV 2018, (3) calculation of the distance of stages in SrV 2018, and (4) calculation of the modal-split figures at stage level in SrV 2018.

**Highlights of Paper 2 and main contributions:**

- *Presentation of a "lean" methodology for the generation of stage information from trip-level HTS data.*
- *Calculation of stage-level modal-split estimates by number, duration, and distance for SrV 2018 (inner-city trips in cities with  $\geq 100,000$  inhabitants).*
- *Enablement of a first-time direct comparison between modal-split shares at trip level and the estimates at stage level.*
- *Presentation of results for cities with  $\geq 500,000$  inhabitants: in average more than three out of six stages per day are walked, with a duration of approximately 28 minutes and a distance of two kilometers.*

Paper 3, as an empirical street-level study, contributes to understanding the characteristics of place activities and explores their relationship with street characteristics. To provide a comprehensive analysis of place activities, the study employs descriptive analysis, GIS-based methods, and simple Linear Regressions to examine how streetscape features influence place activities. Based on a case study sample ( $n = 1,654$  observations), the findings offer new insights into the duration, types, postures, and the daily profile of place activities.

**Highlights of Paper 3 and main contributions:**

- *Provision of a general characterization of place activities within the European context using the case study of the City of Malmö.*
- *Attribution of place activities to the quality of the design of street characteristics (e.g., personalization and permeability of facades/businesses).*
- *Identification of a strong effect of land-uses (businesses and gastronomy vs. offices) on the duration, the type, and the daily profile of place activities.*

The presented papers close existing research gaps and address the introduced research questions. Beyond this, a glossary is developed that consolidates all relevant HTS and place-activity terms. This definitional framework aims to support methodological advancements in HTS and facilitates a more precise description of place activities in public spaces.

In conclusion, this thesis underscores the essential role of pedestrian activities in creating livable and sustainable cities. By identifying determinants on walking and place activities, enhancing the visibility of stages in intermodal trips, and providing a comprehensive definitional framework, this thesis establishes a foundation for seamlessly integrating pedestrian activities into transport-planning context. It equips researchers and practitioners with the knowledge needed to foster human-centered, sustainable urban and transport development.

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