*Symposium: Reframing Research on Urban Mobility and Wellbeing: new technologies, global contexts*

*Convened by:*

*Sara Carr, Northeastern University*

*Jenny Roe, University of Virginia*

*Introduction*

There is now a significant body of evidence to show how the design of streets – and their connectivity to the surrounding neighborhood – can support active living and health outcomes (Sallis et al., 2016). The configuration of our city streets can promote opportunities for health, by minimizing noise and air pollution, providing opportunities for social interaction and promoting urban mobility, in turn helping reduce the risk of obesity, cardiovascular disease, cancer and dementia. A living – or ‘comfortable’ street is a safe, enabling street for everyone, including our older citizens and children and prioritizes pedestrian paths and non-motorized transport (e.g. cycling lanes) over cars.

The upsurge in mobile and/or wearable wireless technologies capable of real-time monitoring and tracking health outcomes has revolutionized data capture over the last decade. This has transformed our understanding of how we interact with our world as we move through it in real-time, as compared to conventional paradigms in environmental psychology which have largely relied on ‘healthy’ participants (i.e. students) in laboratory studies.

This symposium brings together a number of researchers using different methodologies to track mobility patterns in a wide variety of urban settings around the world from the United States (Florida, Virginia, North Carolina, Hawai’i) and abroad (Germany, Kenya, Thailand, and India). This symposium is an in-depth discussion on new directions for mobility research, from integrating technology such as mobile sensors, smartphone apps, and smart watches to contextualizing research in specific place and time. These studies take real world, real-time contexts and expands on their applications to health and environment research.

*Abstracts:*

1. *Real-Time Stress Responses in Outdoor Urban Settings:*

*Speaker: Jenny Roe, PhD: Director, Center for Design + Health, University of Virginia*

*Co-authors:* LauraBarnes, Mehdi Boukhechba, Andrew Mondschein, Nicolas Napoli, Chris Neale, Sally Pusude

This presentation reports on two studies from the US using mHealth sensors to capture real-time stress response to different urban settings. The first study, *Happier by Design*, reports a quasi-experimental study in West Palm Beach, FL, comparing the restorative health benefits of walking a stretch of urban waterfront exposed to a short-term design intervention *versus* a control site with no design intervention. The intervention was designed to specifically promote attributes of psychological restoration including fascination and curiosity. Our study utilized a repeat measures design with participants exposed to the control site and intervention site using a cross-over design with each participant acting as their own control. Three aspects of psychological restoration were measured: subjective mood, perceived restorativeness of the environment and physiological stress captured using a smart watch to measure heart rate variability (HRV) during the walk. Results showed an increase in parasympathetic response (as measured by HRV) and a reduction in perceived stress in the intervention walk, and the opposite pattern whilst walking in the control site (i.e. increased stress). The second study, *Enabling Street Mobility in Elders (ESME)* reports findings from an urban mobility study in seniors (aged 65+) living independently in Richmond, VA. This study design matched the above, but this time explored walking in an urban ‘green’ versus urban ‘grey’ setting. The study design was also extended to explore interactions between subjective wellbeing, physiological stress, cognitive functioning and a range of environmental variables in the living environment (including air pollution, noise and percentage green space). Early findings indicate a positive effect of walking in urban ‘green’ settings on cognitive functioning (as captured by a short cognitive reaction time), physiological stress (as captured by heart rate) and subjective wellbeing (energetic arousal and hedonic tone). The findings are consistent with restorative environment research and are discussed in light of the impact of nature settings on health and wellbeing.

1. *Mobility, Environment, and Well-being: Interactions between Place and Walking in Three Cities in the Developing World*

*Speaker: Andrew Mondschein, PhD AICP, University of Virginia*

 *Co-authors:* Chris Neale and Carla Jones

In developing world cities, the same path may represent walkable access to opportunities, a march through toxic air, or both, depending on individual and community context. While evidence suggests significant health benefits of walking, facets of cities that increase walking rates may also exact a toll on walkers in terms of exposures and well-being. We comparatively present two studies that examine the relationships between environment, mobility, and human wellbeing, seeking a better understanding of individual impacts. The first study looks at Delhi, India, and investigates how daily travel and environmental hazards such as air emissions, water quality, and noise, intersect to shape individual wellbeing across the region’s neighborhoods. We use a purpose-built survey and mapping tool to collect and analyze how travel behavior and perceptions of the built environment are associated with psychological factors including subjective wellbeing, connectedness to nature, and sense of curiosity. We find that daily travel, in particular walking, has a significant effect on wellbeing, but those effects vary significantly depending on the type of environment people live in. The second study focuses on wellbeing of populations within Nakuru, Kenya and Udon Thani, Thailand, both of which are rapidly urbanizing cities. Using these increasingly urbanized cities as test beds affords an opportunity to understand and, crucially, plan for future urbanization. We look to understand wellbeing through questionnaires assessing relationship with nature, stress and wellbeing as well as undertaking short transect walks to understand changes in heart rate variability within changing urban forms. These projects are among the first to explicitly account for the effect of the built and natural environment when considering the relationship between walking and wellbeing. They highlight the importance of treating walking and walkability enhancements as part of a comprehensive set of neighborhood environmental best practices, and not a standalone intervention for improving wellbeing.

1. *Assessing statewide active travel infrastructure in Hawai’i: An equity and policy lens*

*Speaker:* Sara Jensen Carr, PhD; Northeastern University

*Co-authors:* Lehua Choy,Vanessa Buchthal, Ruth Pitt

Under the Healthy Hawai’i Initiative (HHI), the Hawai’i Department of Health has funded two statewide audits of pedestrian and bike infrastructure in an effort to understand opportunities for active travel. The first, done in 2010, assessed just over 300 street segments; the second, conducted in 2016, looked at 420 additional street segments. In the latter study, we reframed the study in order to link objective measures of the built environment, planning policy, and transit access equity. Working with local community partners and the state’s Department of Transportation, we sampled streets that were potentially due to be upgraded under the state’s new Complete Streets policy and construction of a new rail line on the island of Oahu. Using the Pedestrian Environment Data Scan (PEDS) as a survey tool, which measures over 40 objective and subjective dimensions of street design and use, we built a smartphone app to collect data, which also allowed us to more easily enlist surveyors on distant islands.

Our sample confirmed several of the conclusions reached in the 2010 study, namely that roughly 70% of streets surveyed statewide have pedestrian infrastructure, with significant variations between urban and rural areas, while bike infrastructure was very low across the board – less than 4% of streets sampled statewide. This presentation discusses these baseline results, as well as other insights captured by the survey. Moreover, we also discuss the larger value of our follow-up study, which was better aligning the research design to gauge effectiveness of infrastructure policy and transit access equity, as well as changes made to the initial survey to capture the unique built environment contexts of Hawai’i. We found that walkability audits are rarely “one-size-fits-all,” and helpful insights can be gained by framing research through local initiatives, history, and with community partners.

1. *Public space and pedestrian stress perception: Insights from Germany*

*Speaker and Author:* Martin Knöll, [Technische Universität Darmstadt](https://www.researchgate.net/institution/Technische_Universitaet_Darmstadt)

This presentation discusses the role of the built environment on urban stress as perceived by pedestrians in open public spaces (OPS). The author reports on a series of empirical studies carried out with architecture students in which environmental properties for a sample of OPS, including a busy transport hub in the city of Darmstadt, Germany, were constructed using GIS and Space Syntax and paired to users’ ratings. OPS typologies (park, square, courtyard, streets) are the best predictors for perceived urban stress, followed by isovist characteristics, street network characteristics and building density. Specifically, the isovist visibility, vertices number and perimeter, previously related to arousal and complexity in indoor spaces, show significant relation to perceived urban stress in OPS, but with different direction of effects. This overview of influential factors in urban design underlines the need for traffic calming and walkability measures to reduce pedestrian stress levels in urban mobility systems.

1. *Safety by Design: Quantifying the Impact of Urban Design on Traffic Collision, Injury, and Fatality Rates*

*Speaker and Author:* Mariela Alfonzo, PhD, State of Place/New York University, NY

Every 25 seconds, someone dies in a traffic collision. In response, over 35 U.S. cities have created Vision Zero programs (or the equivalent) to make streets safer. But most cities lack data to identify effective ways to eliminate road injuries and fatalities. Additionally, given limited capacity, cities prioritize certain interventions over others, often based on anecdotal evidence, best practices, or simply intuition and gut. Accordingly, many cities struggle to justify “costly” urban design interventions, opting for more affordable enforcement and education strategies that may not be as effective as built environment changes. This study aimed to understand the relationship between urban design and traffic collisions and motorist, pedestrian, and bicyclists injuries and deaths. We compared the “State of Place Index” (a score from 0-100 that aggregates data on 290 urban design features at the block level) of a stratified random sample of 60 intersections in Durham, North Carolina and 302 adjacent blocks to 362 “control” blocks randomly sampled from an existing database of 6892 blocks. Based on preliminary results of a binomial logistic regression, we found that for every 20 points decrease on the State of Place Index, a collision, injury, or fatality was 20 times more likely to occur. We also found that urban form, density, proximity to non-residential destinations, parks and public spaces, pedestrian and bicyclist amenities, personal safety, traffic safety, aesthetics, and connectivity were significantly related to traffic incidents. These results have implications for traffic engineers, planners, and urban designers, signalling that urban design strategies must be integrated within current efforts to create safer streets for motorists, pedestrians, and bicyclists. Additionally, as the State of Place Index is also tied to higher return on investments, based on increased real estate premiums, citymakers can use this methodology to economically justify improvements to urban design and safety.