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Behavioral Mapping and Rhythmanalysis: Spatial and Temporal Patterns of Pedestrian Streets in Hanoi

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Research on streets and public spaces in general has predominantly relied on systematic observation and behavioral mapping to investigate human behavior and its spatial patterns. This approach, however, often lacks the depth needed, especially in densely populated urban areas of Global South cities, to uncover the intricate social processes and politics that shape people's behavior and patterns. In response to this limitation, our study takes a multifaceted approach, combining behavioral mapping (through systematic observation data) with rhythmanalysis (using general observation data and in-depth interviews) to study pedestrian streets with a case study in Hanoi, Vietnam. This research contributes to urban geography and urban studies methodology by analyzing the limitations and strengths of behavioral mapping and rhythmanalysis. We call for combining these methods in a way that allows them to complement each other. Such a combination should provide a nuanced and comprehensive understanding of the temporal and social forces that shape everyday life in public spaces. **Key Words:** critical mapping, socialist city, streetspace.

Streets in the Global South often have diverse and intensive usages, especially because of (informal) street vending, and feature a multitude of embedded politics and negotiations (Turner and Schoenberger 2012; Tucker and Devlin 2019; Adama 2020). Data collected at the street level are useful for designing and planning livable spaces with diverse functions and a more inclusive governance of streets (Tucker and Devlin 2019). Observations of streets, as proposed by Mehta (2009), can provide “information on human behaviour in the study areas, especially on four of the five questions: what, when or where, who and with whom, and how, leaving only ‘why’ as the unknown” (39). Analysis of systematic observational data is usually undertaken visually and statistically (Pérez-Tejera, Valera, and Anguera 2018; Mehta and Bosson 2021; Villani and Talamini 2021) in a method called behavioral mapping. This has been extensively used to visualize human behavior and activities in public spaces (Sommer and Sommer 2001; Gehl and Svarre 2013; Ng 2016) to understand the relationship between urban furniture and other physical settings and people's usage (Goličnik and Ward Thompson 2010).

Yet, as observations cannot answer the “why” question underlying human behavior, sociopolitical processes in and around public spaces are almost ignored in studies using behavioral mapping. To overcome this, previous research has often combined behavioral mapping with theoretical frameworks. Notably, Villani and Talamini (2021) used de Certeau's theoretical framework on tactics and behavioral maps to analyze how immigrants

informally appropriate pedestrian streets in Hong Kong. Other studies focusing on the everyday use of urban street spaces in Vietnam, the focus of our study, often employ theoretical frameworks such as Cresswell's (2010) six facets of mobility in studies of Eidse, Turner, and Oswin (2016), Nguyen and Turner (2023), or Tria Kerkvliet's (2009) concept of resistance, as applied in the work of Turner and Schoenberger (2012). The use of these various frameworks is accounted for by the fact that streets tend to harbor more conflicts and tensions than other public spaces, such as parks. This is especially true in Global South cities, where streets are also a means of livelihood for low-income groups such as vendors (Mitchell 1995; Kim 2012). Furthermore, cities with a high density and intensity of activities add challenges to observational methods, because of the resource-intensive process of data collection. There is a need for a multifaceted and context-sensitive approach to understand how public spaces are used and negotiated, as well as how various forms of informal activities shape urban landscapes in the Global South. Yet, observational data and behavioral mapping, which emphasize spatial visualization, might fail to reveal the exercise of power, conflicts, and politics of public spaces, particularly in the absence of other methods, such as interviews or the review of media articles or policies (Mehta 2009).

To gain deeper insight into social processes and politics underlying the diversity of activities and relationships on streets, there needs to be a methodology that minimizes resources while ensuring a

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comprehensive depiction of public space usage. In this article, we put forward a methodology that uses rhythmanalysis (Lefebvre 2004) to complement systematic observations and behavioral mapping. We use the Hoàn Kiếm pedestrian precinct (Hanoi, Vietnam) as a case study because its high density and crowdedness present challenges for documenting people's usage of public spaces. Additionally, its diverse set of physical elements allows us to test the applicability of our methodology. Specifically, Hoàn Kiếm is one of the most densely populated districts in Hanoi, with a population exceeding 140,000 and a density of over 26,000 people per square kilometer (Hanoi Bureau of Statistics 2023). The Hoàn Kiếm pedestrian precinct serves as a stage for numerous informal economic activities, which previous research identified as sites of significant politics and negotiations (Turner and Schoenberger 2012; Tran and Yip 2020; Turner 2020). Therefore, the case of Hanoi can inform studies elsewhere in the Global South.

Our article has a twofold objective: (1) to identify the strengths and weaknesses of these two methods, and (2) to emphasize the importance of using both methods complementarily when exploring the social and political processes that unfold in public spaces.

The remainder of the article is organized as follows. The next section presents the literature on behavioral mapping and rhythmanalysis, providing a basis for the conceptualization and procedures of these methods. In the following section, we cover the data collection and analytical tools employed. We then present the results depicting public space usage and finally we discuss the differences between these two methods and the factors influencing the choice of methods for public space studies.

Literature Review of Methods

Behavioral Mapping

Behavioral mapping employs systematic observation as a method of data collection (Ng 2016; Sussman 2016), with spatial coordinates being the most important variable in establishing behavioral maps. Systematic observation involves collecting and analyzing structured data, using standardized and "clear" procedures and sampling techniques (Sussman 2016). These procedures typically encompass the use of specially designed data collection forms and detailed observation guidelines such as observed time slots, observed (sub)sections, ways to identify user groups and their activities, and so forth (Ng 2016). This approach allows for the systematic, replicable analysis of human behaviors and their spatial patterns within urban spaces and provides valuable insights into the dynamics of urban life and space usage. A behavioral map is useful in reading what users of public spaces

do and where they are (Ng 2016; Villani and Talamini 2021), as well as users' social representation according to race, gender, or age (Mehta and Mahato 2021). Behavioral maps also depict the presence of interactions among users inside a given space (Ostermann 2010; Cao and Kang 2019) and have been applied in various contexts to examine such particularities as how spatial patterns of activities differ among genders (Bagheri 2014), social groups (Cao and Kang, 2019), and the tactics informal workers and migrants employ to appropriate public space (Turner, Zuberec, and Pham 2021; Villani and Talamini 2021).

Ittelson, Rivlin, and Proshansky (1970) proposed five components of a behavioral map that could be considered as part of the protocols for creating such a map, forming the methodological basis for subsequent investigations (Goličnik and Ward Thompson 2010; Ng 2016; Park, Christensen, and Lee 2020). Ng (2016) enhanced the method by adding a step called pretest to the data collection process of Ittelson, Rivlin, and Proshansky (1970). This additional step is essential, as variations between the laboratory and the field site are likely to arise, highlighting the importance of pretesting in the field. In terms of data analysis, Sanoff (1971) offered different methods for visualizing observational data¹ that are fairly exhaustive and have been used in numerous studies of public spaces (e.g., Goličnik and Ward Thompson 2010; Ostermann 2010; Park, Christensen, and Lee 2020; Mehta and Mahato 2021).

Most of the cited research that uses behavioral mapping has studied parks in Global North cities (Goličnik and Ward Thompson 2010; Ghavampour, Del Aguila, and Vale 2017; Mehta and Mahato 2021) and certain types of streets (Mehta 2009). Streets with high activity density and informality are also absent in this body of literature, with the exception of Villani and Talamini (2021). Streets in the Global South present even more challenges for this method due to the informal nature of many street activities in these regions (Kim 2012). Understanding the streets in the Global South requires different tools to uncover the power dynamics and politics between different actors, especially authorities and street vendors (Turner and Schoenberger 2012; Turner, Zuberec, and Pham 2021). One of the ways to uncover the power and politics underlying spatial and temporal patterns of activities is rhythmanalysis, to which we now turn.

Rhythmanalysis

Rhythmanalysis was developed principally by the French scholar Lefebvre, although scholars from other disciplines have also contributed to it (Edensor 2010b; Marcu 2017; Gibert-Flutre 2022; Sun 2022). It is a conceptual idea of analyzing the rhythms of everyday life and the ways in which they shape the experiences

of individuals in public spaces (Lefebvre 2004; Marcu 2017; Gibert-Flutre 2022). Rhythmanalysis also offers a conceptual framework for understanding how different groups use, appropriate, and negotiate public spaces, uncovering the (hidden) power dynamics among actors, and enabling fine-grained spatial and temporal descriptions of space (Gibert-Flutre 2022). The central concept of rhythmanalysis is rhythms that own temporal and spatial aspects (Crespi and Manghani 2020). Temporality in rhythms is apparent through its recurring patterns, characterized by factors such as velocity, occurrence, and consistency (Evans and Franklin 2010). Spatiality of rhythms is made evident through tangible and sociocultural characteristics of the environment in which the rhythmic activity unfolds.

Yet, to our knowledge, there is no specific methodological protocol for rhythmanalysis. This makes it difficult to understand the temporal and spatial dynamics that shape spaces but also hinders our ability to effectively interpret data. In this article, we propose a conceptual framework using the dual concepts of dominating and dominated rhythms, inspired by Lefebvre (2004). We then outline a methodology to identify and characterize different rhythms, which in turn allows us to understand the spatial and temporal patterns of street usage. Dominating rhythms refer to a specific form of rhythms established by a group of individuals whose activities significantly affect the rhythms of others. This includes monitoring the activities of the police and militias, as well as the street appropriation and consumption patterns of tourists. Inversely, dominated rhythms are those influenced by other rhythms, such as the usage rhythms of street vendors.

Methods

Study Site

The Hoàn Kiếm pedestrian precinct is situated in the Hoàn Kiếm district of Hanoi, Vietnam's capital. It is surrounded by densely populated boroughs and adjacent to the city's prominent tourist attractions and public service facilities. Inaugurated in 2016, the Hoàn Kiếm pedestrian precinct encompasses the zone surrounding Hoàn Kiếm Lake and several streets in the Old Quarter. The streets were closed in March 2020 because of the COVID-19 pandemic, but by March 2022, the zone surrounding Hoàn Kiếm Lake had reopened, promptly restoring the area's vibrant atmosphere (Vietnamplus.vn 2022). During our data collection period (March–August 2022), the Hoàn Kiếm precinct was pedestrianized from Friday evening to Sunday night weekly. The area is known for its natural landscapes (i.e., the lake, impressive trees, and flowerbeds) and architectural elements (Figure 1), which have attracted an average daily footfall of 20,000 to 25,000 individuals since 2015 (Thoibaotaichinhvietnam.vn 2017).

Systematic Observations and Behavioral Mapping

Between April and May 2022, we conducted systematic observations at six sections of the pedestrian zone, about 200 to 300 meters long each (Figure 1). The sections were selected based on two main criteria: (1) the diversity of physical installations and the social usage, and (2) their location allowing a good visibility of the streets with minimal obstruction of views. Following previous studies (Marušić 2011; Cao and Kang 2019), we allocated fourteen thirty-



Figure 1 The six observed sections of the studied pedestrian street, with pictures showing the streetscape.

minute observation time slots (four from 6:00 a.m. to 8:00 a.m., four from 4:30 p.m. to 6:30 p.m., and six from 7:00 p.m. to 10:00 p.m.) on most days, except for Tuesdays and Wednesdays. These times were also chosen to exclude periods with minimal street usage due to Hanoi's heat and human resource constraints. This yielded 300 hours of systematic observations. For each observation slot, we used ArcSurvey123 installed on a mobile device to record the following information about individuals and groups of users: coordinates, group size, gender (male, female, or mixed, if it is a group), activities² (e.g., vending, passive activities, patrolling by police and militias, etc.), and the presence of conflict (yes–no).

To identify the spatial patterns of street users, we created behavioral maps representing users' location with the dot method, as suggested by Ng (2016), in QGIS software. The physical setting of the study area is also represented on the map, allowing for a better examination of the relationship between usage and design (e.g., Ostermann 2010; Marušić 2011; Ghavampour, Del Aguila, and Vale 2017). In sum, we created ten behavioral maps as follows: five behavioral density maps (for each group size) and five activity profile maps (for each category of activities). We also created a heat map of the temporal uses of the street activities and two heat maps that indicate the association between activities and group size and their spatial distribution in the pedestrian streets by using the command *Plotly*.³

Interviews, Video Recording, and Analysis of Rhythms

We interviewed three groups, totaling forty-four individuals (twenty-six vendors, sixteen local residents,⁴ and four officials [two from the Management Committee of the Old Quarters and Hoàn Kiếm Lake, and two heads of residential units]). Each interview ranged in length from forty minutes to more than an hour. We performed content analysis using inductive coding to identify the conceptual basis of rhythms, followed by deductive coding to distinguish dominated rhythms from dominating ones.

Additionally, to supplement our systematic observations, we video-recorded street activities on one weekday and one weekend, producing fifteen to thirty minutes of video footage for every hour of observation. These two sources of data allowed us to identify two types of rhythms: dominated rhythms (produced by vendors, locals, and tourists) and dominating rhythms (produced by police and militias). We created a spatial-temporal portrayal of pedestrian street usage by mapping the two types of rhythms for each of the sections of the pedestrian street, inspired by qualitative cartography methods (Bagheri 2014; Turner, Zuberec, and Pham 2021).

Results

Spatial and Temporal Patterns of Pedestrian Street Usage

Our data reveal a diverse range of activities taking place on Hoàn Kiếm street. Passive activities⁵ are the main use, mostly done by visitors,⁶ accounting for nearly 58 percent of the total observations. This is understandable, given that Hoàn Kiếm is one of Hanoi's most renowned tourist attractions, drawing millions of visitors each year. The second most common activity is sport (nearly 23 percent of the total observations). The remaining activities occupy a relatively small proportion (from 0.3 percent to just under 5 percent; Table 1).

In terms of gender groups, 30 percent of the street's users were male compared to 26 percent female, and mixed genders were the most important. This finding contrasts with that of Zapata and

Table 1 Frequencies of users by activities, genders, age groups, and group sizes in Hoàn Kiếm pedestrian street

Category	Frequency	Percentage
1. By types of activities		
Passive	2,593	57.8
Sport	1,026	22.9
Vendor	162	3.6
Police/militias	111	2.5
Photographer	37	0.8
Street art	74	1.7
Romantic couples	215	4.8
Beggar	12	0.3
Rickshaw and motorbike taxi ^a	36	0.8
Other	218	4.9
2. By sections		
Section 1	918	20.5
Section 2	864	19.3
Section 3	607	13.5
Section 4	668	14.9
Section 5	724	16.1
Section 6	703	15.7
3. By group sizes		
Individual	1,384	30.9
Pairs	1,740	38.8
G3–10 (3–10 people)	1,216	27.1
G11–20 (11–20 people)	112	2.5
G20 plus (more than 20 people)	32	0.7
4. By gender		
Male	1,371	30.6
Female	1,165	26.0
Mixed genders (in group)	1,948	43.4
5. By age groups		
Children (younger than 14)	83	1.9
Teenager (15–25)	1,569	35.0
Adult (26–60)	1,894	42.2
Elderly (older than 60)	424	9.5
Mixed age (in group)	514	11.5
6. By time periods		
Morning (6:00 a.m.–8:00 a.m.)	1,291	28.8
Afternoon (4:00 p.m.–6:30 p.m.)	1,481	33.0
Evening (7:00 p.m.–10:00 p.m.)	1,712	38.2
Total	4,484	100.0

^aThese two activities were grouped together because rickshaw and motorbike drivers operate in similar ways. Their presence on the pedestrian street is negligible compared to other activities.

Honey-Rosés (2022), which suggested that as public spaces become more crowded, they might act as barriers for women's participation. Additionally, a significant proportion of mixed-age groups (comprising tourists and group exercisers) was observed on the street (42 percent). The teenagers and adults dominated, constituting nearly 77 percent of the total

observations. There was also a significant number of elderly users (approximately 10 percent) and mixed-age groups (over 11 percent). We also noted that elderly individuals and groups used the pedestrian street primarily for physical exercise.

Regarding the spatial variations of activities on the pedestrian street, our results indicate a

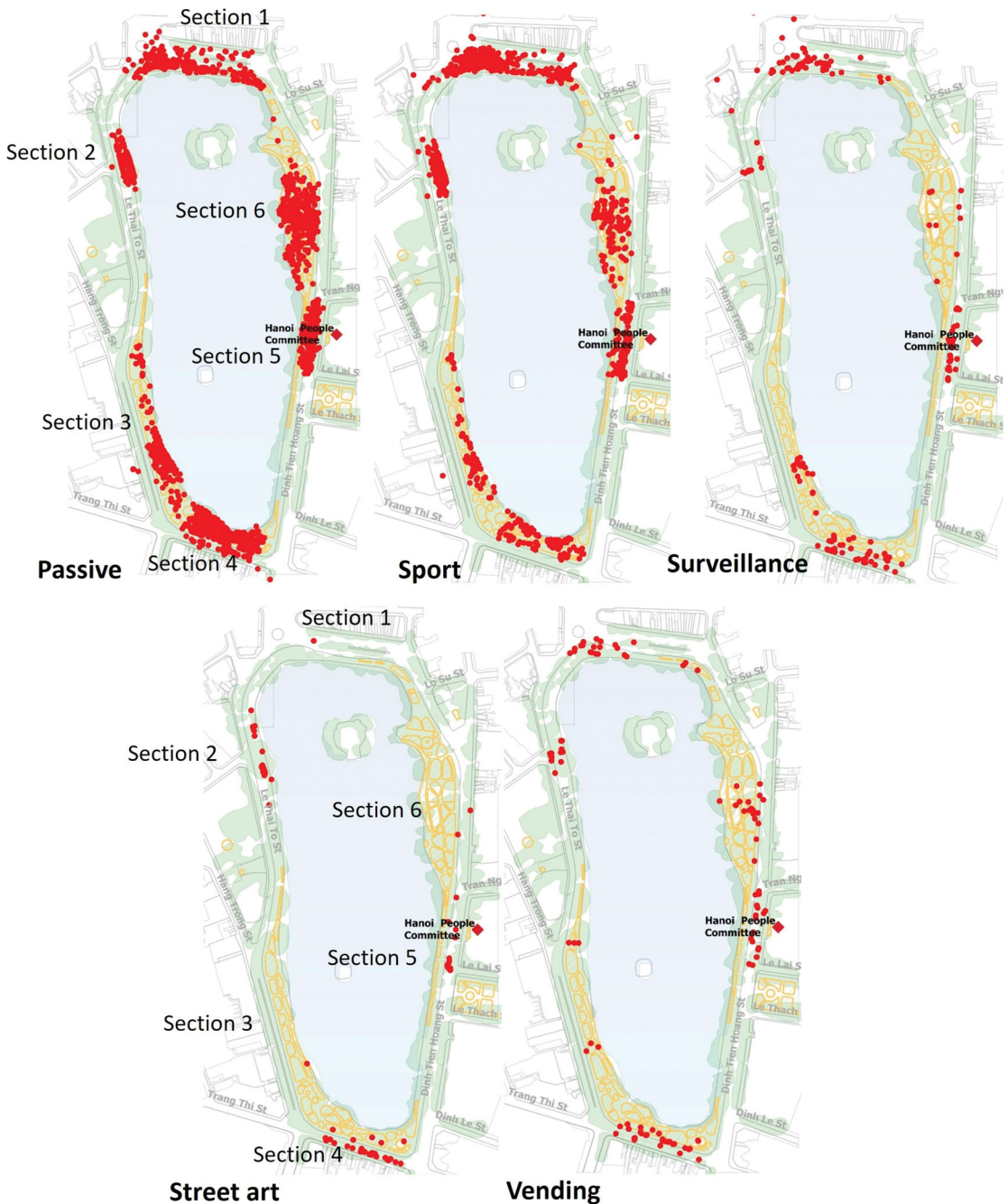


Figure 2 Spatial distribution of principal activities in the pedestrian street.

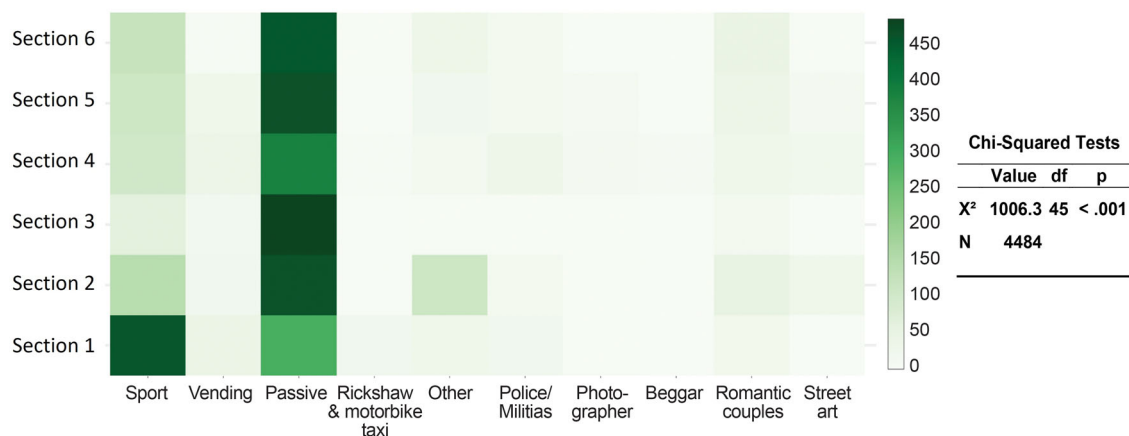


Figure 3 Heat map and chi-square tests for the variables section and activities.

significant difference in activity patterns across the six sections.⁷ There is a significant association between two variables: section and activities (chi-square test significant at $p < .001$; Figure 2). For instance, the sport activity predominantly occurred in Section 1 (45 percent) and was scarcely found in Section 3. Meanwhile, street vending was scattered across all sections except for Section 6. The surveillance activities were more frequent in Sections 1 and 4 and less prevalent in other sections, with the least frequent occurrence in Section 3.

When considering group sizes, our data show that individuals, pairs, and groups ranging from three to ten users represent the largest portion (30.9 percent, 38.8 percent, and 27 percent, respectively). Larger groups, comprising—ten to twenty users and more than twenty users, constituted smaller proportions (2.5 percent and 0.7 percent, respectively). Our chi-square test again reveals a significant association between group sizes and sections (chi-square test significant at $p < .001$; Figure 3).

This association is most evident in groups of more than ten individuals. For example, groups with more than twenty people are predominantly distributed in Section 2 (nearly 70 percent) but are absent in Sections 1 and 3 (Figure 4). Similarly, user groups consisting of ten to twenty people are primarily found in Sections 2 and 6 (42 percent and nearly 27 percent, respectively), and are significantly less prevalent in Sections 1, 3, and 4 (below 10 percent).

The maps in Figures 4 and 5 suggest that the spatial distribution of activities and group sizes is not random but could be influenced by the characteristics of each section (i.e., the density of furniture, landscape design, and social usage). For instance, Section 6 features many installations for recreational activities, which attract more passive activities. In contrast, Sections 1, 3, and 5 offer

more spaces for group exercise (e.g., Lý Thái Tổ garden), which attract larger user groups. Understanding these patterns is crucial for urban planners and policymakers to manage crowd dynamics and optimize the use of public spaces. Explaining these associations requires a closer look at physical settings as well as forms of control in each section.

To do so, we compared behavioral maps (Figures 4 and 5) with the distribution map of amenities (Figure 1). Yet, it quickly became obvious that drawing conclusions about the relationship between the density of amenities on the street and usage density in our study zone would be challenging, despite numerous studies proving that behavioral maps are highly effective for understanding the relationship between design elements and spatial use (Mehta and Mahato 2021). Several factors could account for this. First, the studied street's importance as a famous tourist spot in Hanoi, combined with its high density of local residents, results in a very crowded environment. Second, the scarcity of public spaces in Hanoi (Pham and Labbé 2018) makes the Hoàn Kiếm pedestrian street highly appreciated and popular. Patterns of usage are hence likely to be independent of the number and location of amenities and furniture found in the study area.

In terms of temporal patterns of usage, the chart in Figure 6 reveals that the passive activities and street vending occurred throughout the day. Accordingly, the monitoring by police and militias occurred throughout the day but peaked during three main time slots, from 7:30 a.m. to 8:00 a.m., 6:00 p.m. to 6:30 p.m., and 7:30 p.m. to 8:00 p.m. Sports, on the other hand, tended to take place primarily in the morning, before 8:00 a.m. This can be attributed to Hanoi's hot weather in the summer (normally hottest from 8:00 a.m.–5:00 p.m.),



Figure 4 The spatial distribution of people in the pedestrian street according to the size of their grouping.

which motivates residents to exercise in the cooler morning hours, and avoid crowdedness caused by tourists. The other activities on the pedestrian street tended to occur more frequently in the afternoon and evening (approximately 33 percent and 38 percent of total observations, respectively). Again, to further explain these time patterns, we need more data and insights from our rhythmanalysis in the next section.

Rhythms of the Pedestrian Street: Combining Behavioral Mapping and Rhythmanalysis

We chose to look at two specific groups: vendors, who represent user activities, and police and militias, who represent monitoring activities. The rationale behind our choice lies in the importance of negotiations over access to public space between these two groups, as demonstrated by previous research on the streets of Global South cities (Yatmo 2008; Turner

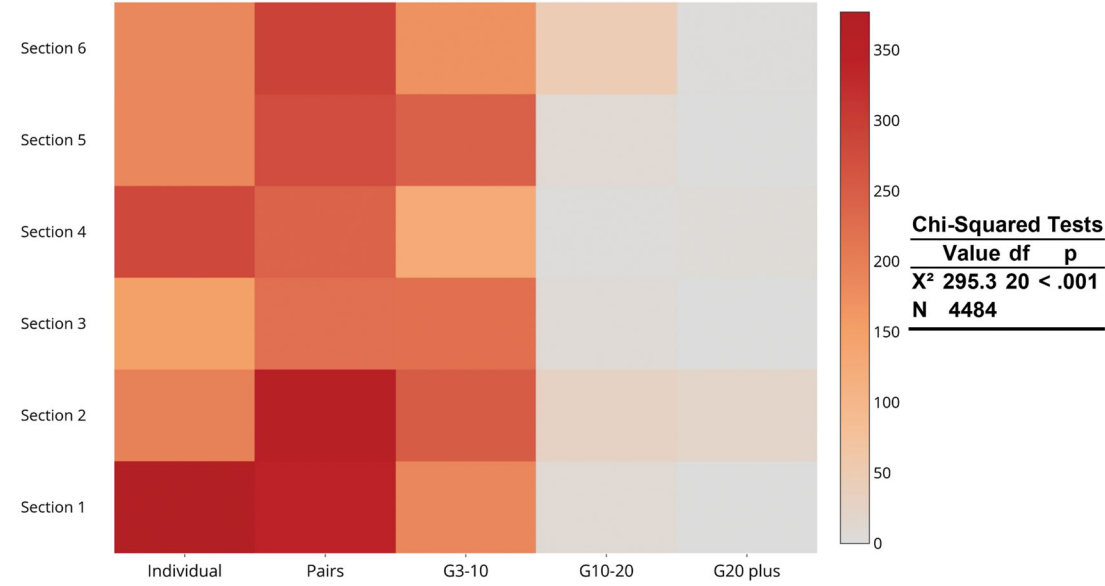


Figure 5 Heat map and chi-square tests for the variables section and group size.

and Schoenberger 2012). In addition, this approach allows us to delve into the power dynamics, regulations, and resource allocation that unfold on the Hoàn Kiếm pedestrian street. Based on the behavioral maps of these two groups, we visualize the intensity of these groups' rhythms. For vendors, we noted how they appropriated the street for their livelihoods, for example, by setting up stalls and attracting customers. As for the police and militias, we documented their surveillance and enforcement activities, such as patrolling and fining street vendors. We created two new maps (Figure 7) in which we represented the intensity of rhythms for each of the six observed sections. The intensity of rhythms was determined by their occurrences from our video data.

Interviews with participants allowed us to explain the patterns of street vendors' rhythms, which complement the findings from our observation data. It should be noted that vending is prohibited in pedestrian areas according to the city's by-laws (Hanoimoi.com.vn 2021; Hanoi People's Committee 2022). We observed significant heterogeneity in rhythms across the groups and sections. More specifically, the rhythms of surveillance groups were higher near the Hanoi People's Committee Building and other key municipal administrative agencies. In less monitored areas, such as Hàng Khay (southern edge) and Đông Kinh Nghi-tha Thục Square (northern edge), the intensity of vending is higher. These street segments are principally commercial, with many small shops. Our maps testify to the persistence of vending activities in public spaces in Hanoi,

suggesting that vendors had to make substantial efforts to gain their right to these spaces. Figures 6 and 7 show that these groups occupied the same parts of the streets but at different time points.

Many vendors viewed street vending as a vital and irreplaceable livelihood due to limited education or age-related factors. Some vendors shared that they "never had much education" or that they are "old now and don't know what to do" (other than street vending; Interview 2022). Despite lacking official permits to vend in public spaces as per Hanoi's regulations (Hanoi People's Committee 2008), these vendors continued to operate in public spaces like pedestrian streets. Many of our interviewees were aware of the regulations against street vending, but "never complained [about these regulations]" (Interview 2022), as they had no alternative for earning a living.

To gain access to the pedestrian street, vendors employ various tactics, to borrow the term from de Certeau (2011), to evade police and militia surveillance. Our findings echo previous studies in Vietnam (Turner and Schoenberger 2012; Eidse, Turner, and Oswin 2016), which outlined simple tactics that vendors used, such as evading police and militia after being seen. For them, street vending inherently involves "being chased and running away" (Interview 2022). One of our interviewees, who was not a vendor but a photographer, and therefore less affected by the police's control, confirmed such a relationship between police and vendors:

When the police pull them over, they fine them, take their goods. But vending is their job, so they



Figure 6 Local residents engaging in morning exercises (top) and street vendors on the pedestrian street (bottom).

have to keep doing it. Chasing and pulling over is the job of the police and militias, but the vendors still have to live by vending.

The maps and graphs shown earlier clearly illustrate the “running away” tactics vendors use to avoid paying fines.

Another tactic is paying nonofficial fees (bribes) to militia to get permission to vend on the pedestrian streets. A local resident shared his own experience selling bottled water on the Hoàn Kiếm pedestrian street when he was a third-year college student. He explained that people cannot come to the street to sell their wares, and that many have been pulled over, “probably because they didn’t pay fees of 500,000 VND [about US\$20] per week to sell water there” (Interview

2022). These tactics illustrate the vendors’ capacity to adapt to and avoid police presence and surveillance strategies that restrict their access to public spaces in Hanoi. These tactics also attest to the persistence of street vending in Vietnamese cities, while demonstrating its importance in the lives of marginalized individuals and the Vietnamese economy (Turner and Schoenberger 2012).

Despite strict regulations against street vending in public spaces (Hanoi People’s Committee 2008), the way local authorities undertook surveillance was not always consistent. A common reason for this noncompliance with stricter government regulations was the sympathy (*thông cảm* in Vietnamese) local authorities had toward certain types of vendors. As a female vendor shared:

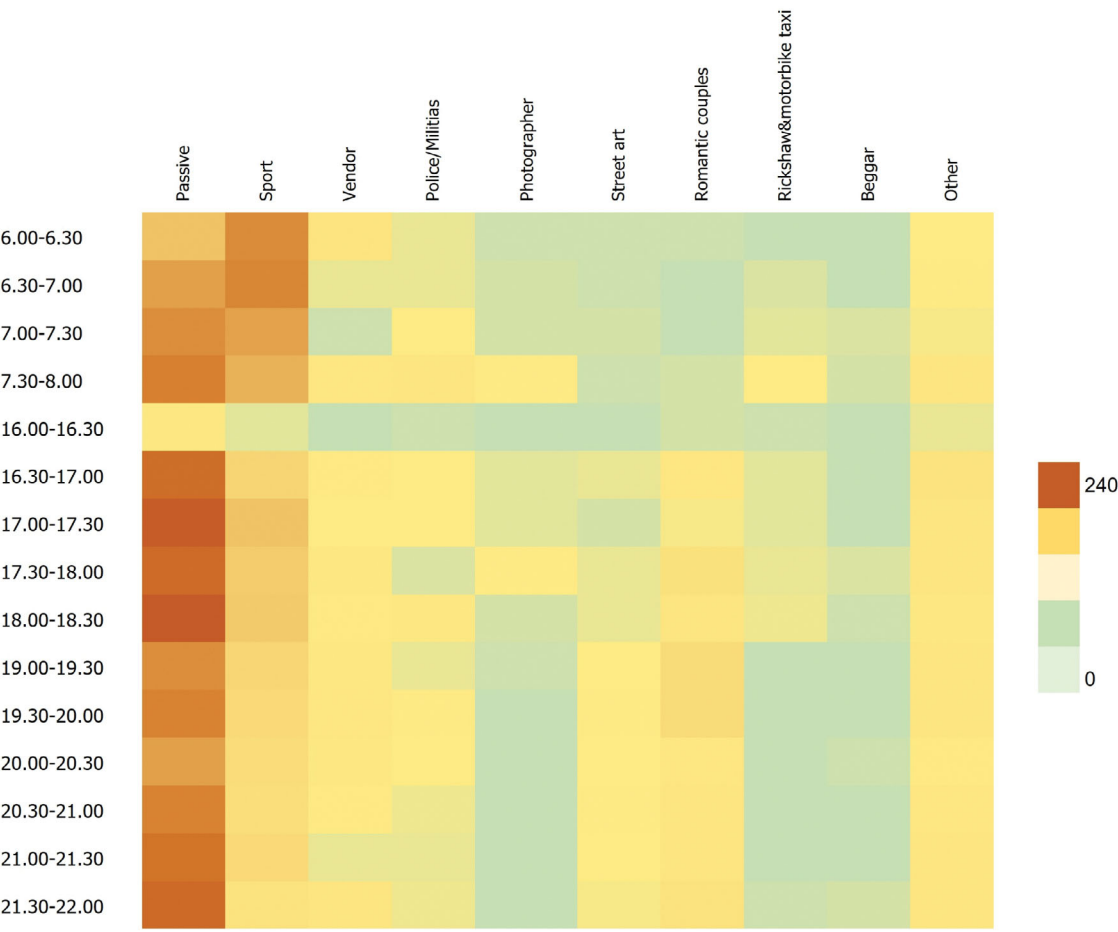


Figure 7 Temporal use of the Hoàn Kiếm pedestrian street (colors and their intensity reflect the occurrence of users counted on the pedestrian streets).

I know street vending is absolutely banned. They [police and militia] just turn a blind eye to me because I am visually impaired, but healthy people are chased away. They don't allow anyone to stay. (Interview 2022)

Together, differing tactics, negotiations, and varying levels of control over certain groups resulted in the observed spatial and temporal usage of the streets.

Discussion

Comparing Behavioral Mapping and Rhythmanalysis

We underline three complementary aspects of the two methods. First, behavioral maps prove to be more useful in demonstrating the relationships between street usage and amenities available on the streets. In densely

populated and complex zones such as the Hoàn Kiếm pedestrian streets, however, this method proved less effective. In such contexts, rhythmanalysis is better suited for identifying interactions between groups of users in public spaces because it adds a temporal dimension to the usage of space.

Second, behavioral maps facilitate a more complete investigation into the relationship between human beings and their physical surroundings, commonly referred to as *place* (Agnew 2011). Conversely, rhythmanalysis, as a conceptual guidance, allows us to identify and characterize rhythms. Analyses of rhythms examine the repetitive patterns and cycles of human activities, highlighting the temporal structures that shape social life (Edensor 2010a; Crespi and Manghani 2020). In other words, rhythmanalysis helps develop conceptual basis and empirical methods to explain how people use space by emphasizing the temporal and rhythmic aspects of space use. As such, rhythmanalysis is useful to apprehend the interaction between human beings and space defined by

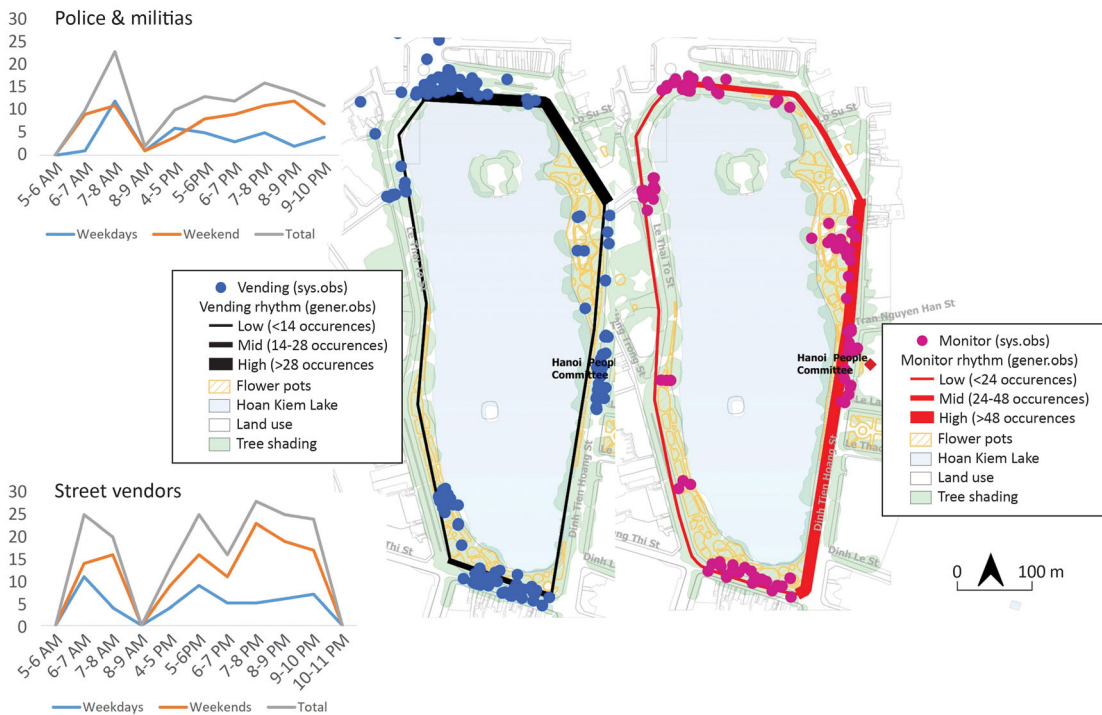


Figure 8 Spatial patterns and rhythms of vending (blue dots) and monitoring (purple dots) activities on the Hoàn Kiếm pedestrian street.

Soja (1989) as “a product of social translations, transformations, and experience” (80).

Third, behavioral maps enable us to visualize the spatial usage patterns of different groups to a greater degree than rhythmanalyses. Yet, deploying systematic observation and conducting behavioral maps in a large area with complex geometrical shape is challenging. Behavioral mapping is hence more useful in the study of small-sized spaces or spaces with simple shapes. Conversely, a rhythmanalysis is better suited for larger, crowded spaces having complex shapes (Figure 8). Although rhythmanalysis is not as visually effective as behavioral maps, this conceptual thinking excels in representing the temporal patterns of use, regardless of whether they involve mobile or stationary activities, which then helps identify social processes and politics for in-depth investigation.

Context Matters When Conducting Observations

Four key elements of a space’s physical setting influence data collection: street network layout, street design, density of buildings and people, and tree cover. We recognize that all of the physical settings and spatial patterns of activities result from social and political processes, following Lefebvre’s (1991) theory of the production of space, but we choose to focus on the physical aspects of space (perceived space) as they are easy to identify for researchers in

the field. In terms of street layout, the pedestrian precinct in Hanoi forms a loop around Hoàn Kiếm Lake, with an area of approximately twelve hectares and a circumference of 1,750 meters, resulting in a more time-consuming and laborious observation process than one where streets are designed to follow a grid pattern (in many Global North cities). Indeed, the grid pattern in general greatly facilitated the task of the observers, who only needed to stand at intersections to observe both sides of the street, provided that the selected segment was sufficiently short (around 50–100 meters).

Where street design is concerned, Hanoi’s pedestrian street includes a roadway but the sidewalks on both sides have an unequal width and very different features. More specifically, in the area around the lake, the narrowest sidewalk is about five meters wide, whereas the widest is up to fifty meters. Conducting observations was specifically challenging at corners, especially when the observers’ view was obstructed by buildings. Finally, in terms of tree cover, the larger tree canopy in our study precinct also added a level of difficulty to our observations, as it reduced observers’ line of sight. Additionally, informal worker groups, such as vendors, often hide behind big trees in the pedestrian precinct to avoid police and militias.

Economic activities and cultural events also added complexity to our data collection. In Hanoi, sidewalks were not always present throughout the streets and



Figure 9 (A) A police officer strolling down the street while street vendors continue their business on the left sidewalk. (B) Vending activities on Hoàn Kiếm pedestrian street, despite the red Vending Prohibited sign.

were often used for purposes other than walking—namely street vending and advertising. As a result, the streetscape was cluttered and complex, making systematic observations difficult. During our field work, it was common to encounter cultural activities, particularly music performances and fairs promoting local products, with the area around the lake having five official art performance points. Such events resulted in great density and attracted a larger number of visitors, making observations more challenging. In addition, the streets became heavily congested because of activities drawing visitors in, hence intensifying the ongoing pursuit between police or militias and street vendors. Numerous street vendors persisted in their vending, particularly when events occurred, despite the presence of monitoring forces and signs prohibiting their activities (Figure 9). In sum, we underline the importance of

local context on methodological choices in researching public spaces. Our findings also resonate with those of authors such as Qian (2020), who have argued that public spaces serve as a lens for understanding both conceptual and empirical aspects of cities.

Conclusions

This study shows the benefits of combining behavioral mapping and rhythm analysis. Behavioral maps provide a visual and analytical tool for tracking and understanding patterns of human activity, movement, and interaction within a given environment. By mapping behaviors in specific locations, researchers can understand how physical environments influence human actions and vice versa

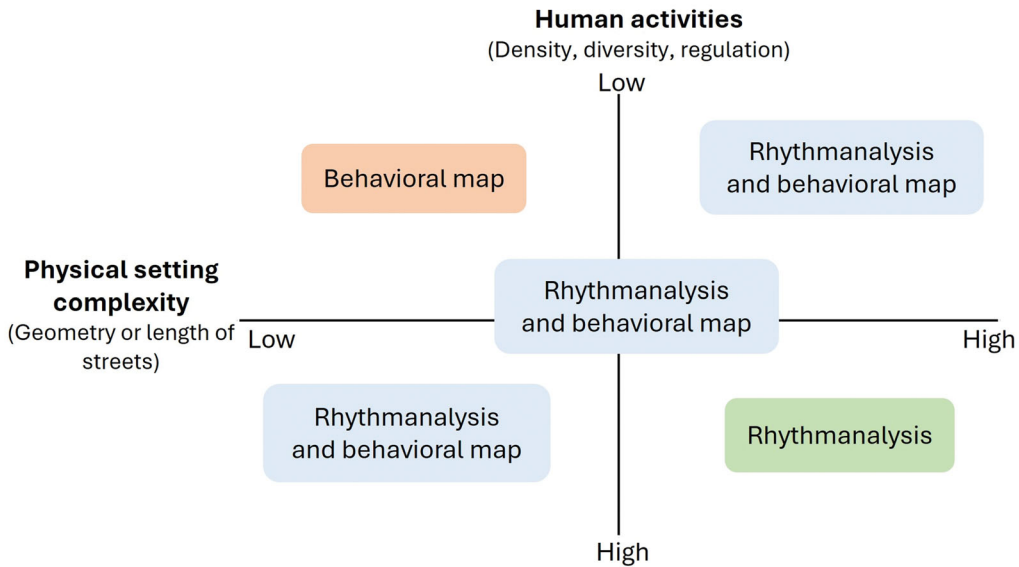


Figure 10 The suitability of behavioral mapping, rhythmanalysis, and the combination of these methods in different contexts.

(Marušić 2011). This method allows for the examination of both tangible and intangible aspects of place, such as the ties individuals have with their surroundings (Ng 2016; Sussman 2016). Yet, the social and political processes underlying this usage remain unaddressed. Therefore, incorporating a conceptual perspective like rhythmanalysis helps researchers explore how daily routines, cultural practices, and social interactions contribute to the production and transformation of space. This combination also allows researchers to immerse themselves in the study area and thereby truly understand the overall picture of the study area. By unearthing these patterns and politics, we can contribute to the creation of more inclusive public spaces. Nonetheless, we acknowledge that the choice of method also depends on the specific objectives, human resources, and financial resources of each study, rather than just the type or context of street spaces.

It should be noted that our research is limited to several characteristics of behavioral maps and rhythmanalysis. Other aspects, although worthy of comparison, lie beyond the scope of this study. For instance, data from systematic observations can help us determine the rhythms of users, similar to what Ghavampour, Del Aguila, and Vale (2017) and Park et al. (2020) did in the case of parks. These rhythms, however, usually represent stationary activities, omit movements, and only reflect the physical nature of rhythms. This simply indicates the frequency of occurrence of activities rather than showing social characteristics, operational mechanisms, or the interaction of different rhythms created by different user groups across

both spatial and temporal scales. Similarly, data from video recordings can also help us build behavioral maps, but these maps will not be as accurate as maps built from geographical data collected by specialized applications. ■

Disclosure Statement

No potential conflict of interest was reported by the authors.

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Notes

¹ Including (1) behavioral density, the overall frequency of all activities in a place; (2) activity profile, the frequency of certain types of activities; and (3) behavioral range, the range of various activities. See more in Sanoff (1971).

² Our classification of activities in the Hoàn Kiếm pedestrian precinct is based on the work of previous authors, including Gehl and Svarre (2013), Ghavampour, Del Aguila, and Vale (2017), and Marušić (2011).

³ See <https://chart-studio.plotly.com/create/>.

⁴ Two locals are also the heads of the residential unit.

⁵ These are activities such as phone usage, chatting, sitting, standing, and so on.

- ⁶ In this study, we identified social groups based on their social presentation and the activities they engage in on the pedestrian streets. For example, local residents predominantly participate in sports activities during the early morning (5:00 a.m.–7:00 a.m.) and late afternoon (5:00 p.m.–6:00 p.m.), typically dressed in casual attire such as shorts, T-shirts, and sporting sneakers (Figure 10). In contrast, tourists are often more elaborately dressed, carry accessories, and engage in a wider range of activities (i.e., photography, strolling, participating in events, etc.). They are present on the pedestrian streets during most of the observed time periods.
- ⁷ Yet, further investigation is needed to examine the correlation between design and the distribution of activities.

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