Nakhara: Journal of Environmental Design and Planning (2021)
Volume 20(2), Article 115
DOI: https://doi.org/10.54028/NJ202120115

Understanding Thai Urban Pedestrian Culture During Noon Break: How Sidewalk Users Experience the Walking Infrastructure in Bangkok, Thailand

Shusak Janpathompong[1,2,3], Akinobu Murakami[3*]

[1] Regional, Urban, & Built Environmental Analytics, Faculty of Architecture, Chulalongkorn University, Thailand
[2] Department of Landscape Architecture, Faculty of Architecture, Chulalongkorn University, Thailand
[3] Graduate School of System and Information Engineering, University of Tsukuba, Japan
[*] Corresponding email: murakami@sk.tsukuba.ac.jp

Received 2021-09-29; Revised 2021-10-20; Accepted 2021-11-03

ABSTRACT

The noon break or lunch hour in Bangkok's central business district (CBD) is when pedestrians wander around for various activities and purposes, in addition to having a meal, within a limited time frame. It is the only break from their daily working routines for energy recovery or socializing, which, in turn, increases readiness to continue working in the afternoon. Commercial activities preferred by pedestrians during this break contribute to increased economic activity. Since pedestrian behavior depends on the cultural context, this research aims to understand Thai urban pedestrian culture that benefits the public, both socially and economically, and to investigate pedestrians' experience of the physical quality of their walking infrastructure, reflecting their preferences.

According to the information gained from observation, a field survey of four hundred thirty observations, and descriptive statistics, the urban pedestrian culture in the CBD of Bangkok is a combination of various activities related to a way of life; 69.4% and 44.9% of observed pedestrians have secondary and tertiary purposes. These multi-purpose trips during lunch hours include having meals, shopping, recovery from work, socializing, and taking care of business or running errands. The routine of lunch outings declined only slightly after the start of the pandemic in early 2020 compared to the pre-pandemic level (81.8% compared to 94.9%). Socializing has strong presence in the culture; 90.5% of group outings occur at least once or twice a week.

On the physical side, the walking infrastructure, mainly comprising sidewalks, is used for circulation and as a place for social and economic settings. Using hierarchical cluster analysis, pedestrians' concerns about the physical environment were divided into five groups, as follows: Cluster 1, people concerned about thermal comfort, surface conditions, and sidewalk obstructions. Cluster 2, people concerned about thermal comfort and walking distance. Cluster 3, people concerned about level changes and walking distance. Cluster 4, people concerned about surface conditions and sidewalk obstructions. Lastly, cluster 5, people concerned about sidewalk obstructions, traffic safety, and level changes.

In conclusion. significant problems experienced or causing concern to pedestrians include sidewalk obstructions of flow due to insufficient width of the walking space as well as blockages caused by utility infrastructure, or social or economic activities, walking distance, surface conditions of sidewalks, level changes, thermal comfort, and traffic safety, respectively. These experiences and concerns reflect pedestrians' preference for better quality of walking infrastructure. Therefore, inducing walkability is a promising physical strategy for promoting and sustaining Thai urban pedestrian culture.

Keywords: urban pedestrian culture, urbanism, commercial urban activities, CBD of Bangkok, experience on walking conditions, noon break

BACKGROUND

Noon breaks or lunch hours are the time slots during a working day when people and workers can go out for their preferred activities or recreational purposes outside of work. In the central business district of Bangkok, these activities are even more intense than during the morning and evening rush hours. Unlike walking to and from appointments, deliveries, bus stops, transit stations, or the workplace, this outing is not a mandatory trip but a desirable one. According to Takahashi et al., (1998), Trougakos et al., (2008, 2014), and Demerouti et al., (2009), having a break allows recovery and increases work readiness and performance. From the observation within Bangkok's CBD during the lunch hours, pedestrians are wandering and filling sidewalks, restaurants, street food stalls, flea markets, and many other places. They enjoy activities such as having meals, socializing, shopping, and many others.

One kind of activity seen along major sidewalks of these areas is the informal commercial activity, especially street food stalls that agglomerate near activity hubs such as school entrances, fronts of shops and stores, mall entrances, access areas to transit stations, or places where customer flow is consistent. Some spots in the CBD become temporary flea-markets, where street vendors cluster in groups for commercial activities that happen specifically at noon hours every working day, serving street users from nearby areas. These commercial vendors sell street food, snacks, stationery, clothing, household items, fashion accessories, gifts & souvenirs, and many other products. During the noon hour, this urban economic activity provides affordable food and goods at a lower cost, suitable for middle-income pedestrians, which comprise the majority of street users in the CBD, creating an eco-system of mutually supporting activities. In Chiangmai, the largest city in the country's northern region, it was found that people favor eating out due to convenience, and they usually go in groups outside their workplaces for socializing and a change of environment (Saswattawong, 2009). This behavior is consistent to that of Bangkok and other major cities in Thailand. In this regard, a sidewalk becomes a place for communication and commercial settings, as well as pedestrian traffic distribution. This pedestrian behavior is supported by physical infrastructure and determined by culture, especially the culture of informal street users (Mateo-Babino & Ieda, 2007). However, this pedestrian culture, which uses the sidewalk as a meeting and socializing place in addition to its intended utilitarian purposes (Gehl, 2011), is considered to create a connectivity problem or an obstruction to pedestrian flow according to the concept of the Level of Service-LOS in the transportation discipline (Gallin, 2001; Lo, 2009). Therefore, in the planning and design of sidewalks, these socio-economic and cultural norms should be considered, particularly in Southeast Asian countries (Mateo-Babino & Ieda, 2007). This pedestrian culture is unique in the Thai urban context. It is an essential element of local economic success, yet the supporting physical conditions have yet to match the demands of these crucial economic and social activities. Therefore, it is vital to recognize the physical elements that encourage or discourage urban inhabitants from utilizing public streets and sidewalks during their noon breaks.

The objectives of this research are to: 1) understand Thai urban pedestrian culture during noon break or lunch hours, 2) examine the

physical parameters contributing to experiences or concerns of users with regard to the outdoor walking infrastructure during the lunch hours that would encourage or discourage usage of such infrastructure in the central business district of Bangkok, Thailand, and 3) suggest revitalization strategies regarding walking infrastructure in order to sustain and promote commercial urban activities. As such, the research questions are as follows:

- What is the Thai urban pedestrian culture in the CBD during the noon break, concerning physical walkability?
- What are the experiences or concerns of pedestrians regarding walking conditions?

LITERATURE REVIEW

Evidence of the relationship between the physical environment and the culture of pedestrians is found in many studies. Either in general or specific purposes or activities, environmental design influences pedestrian behavior. The importance of walking changes, depending on the relative levels of environmental variables (Shriver, 1997). Cultural context determines pedestrian behavior (Sueur et al., 2013). Knowledge of behavior, street sociology and culture contribute to enhancement of the sustainability of sidewalk space in Asian countries, according to a study by Mateo-Babino and Ieda (2007), which defines a pedestrian need-hierarchy that can sustain the sidewalk environment and its usage based on six criteria: mobility, protection, ease, enjoyment, equity, and identity. Protection is the most important among these six criteria, while enjoyment is the least (Mateo-Babino & Ieda, 2007). Similarly, Burton and Mitchell (2006) suggested six design characteristics that make a street livable, strengthen the place's identity, and improve the users' experience. These characteristics are familiarity, legibility, distinctiveness, accessibility, comfort, and safety. These criteria or characteristics show that there are two aspects involved in the design and planning of streets and sidewalks: physicality, and sociability or culture. Since streets and sidewalks have both physical and social contexts, the socialization process is directly influenced by physical configuration (Resuloğlu, 2020). In fact, the social activities of street users define the shared meaning (i.e., culture) of the street. Without essential social interaction or activities, societal issues are indicated due to missed opportunities (Demerath & Levinger, 2003).

Mateo-Babiano (2009) studied three southeast Asian cities: Bandung, Indonesia, Bangkok, Thailand, and Manila, the Philippines. The findings show a similarity in street uses as a reflection and continuity of past street culture. Today, especially in Bangkok, *sois,* which are small streets built to access shophouses for commercial activities, are a unique blend of residential and commercial space because living and working occur in the same place. These *sois* accommodate commercial activities, communication, and street life culture where food stalls, for example, can be found at the entry to a Soi (Mateo-Babiano, 2009). In Bangkok, the Sampeng area in Chinatown and Soi Lalai Sap in Silom-Sathorn (one of the studied areas) are two well-known examples. They represent streets and sidewalks that blend into a single venue, providing consumer products and food markets that reflect the local lifestyle. The streets and sidewalks are transformed into a marketplace (Figure 1).

Figure 1

Sampeng area and Soi Lalai Sap, samples of market place streets

Note. Sampeng, a neighborhood in Bangkok's China town populated by Thai-born Chinese, has grown into a tightly-knit area of streets and pedestrian networks with small urban blocks where residential and commercial activities are mixed. Pedestrians and vehicles share the same space simultaneously (left). Soi Lalai Sap (Silom #5 Lane), a small alley at the central location of the study area, Silom-Sathron, is popular among pedestrians and office workers. For over three decades, the alley has been home to a famous marketplace offering a variety of food, clothing, cosmetics, souvenirs, and many other consumer products. Activities are always most intense during the noon break.

Sidewalk as a socio-cultural setting

The sidewalk provides a socio-cultural scene. It is where people meet, talk, and interact in a normal and relaxed way. Activities on the sidewalk create the potential for social interaction necessary to sustain the culture's meaning (Demerath & Levinger, 2003). Among Asian countries, the sidewalk has traditionally been used as a space for economic opportunities, a social interaction setting, and an extension of living space accommodating both walking and standing still for commercial or social interactions (Mateo-Babino & Ieda, 2007). In Phuket, Thailand, street food represents a key element of the local heritage, cultural knowledge, and way of life, contributing to the uniqueness of the place, that is passed on from one generation to another (Torres Chavarria & Phakdee-auksorn, 2017). Economic factors connected to the sale of street food have also positively affected the market, with the most significant impact created by the users (Nonthapot, 2019). This informal economic sector or group of street vendors is viewed as presenting challenges such as disruptions to pedestrians, obstructions to traffic, and visual pollution of the urban scene. However, these vendors and related activity can be directed and managed by government policies (Pasciana et al., 2020).

People use the sidewalk for various purposes. In running an errand for necessities, the sidewalk is used for circulation; when venturing out for refreshments or shopping, the sidewalk provides a recreational setting and becomes a destination. Purposes are fundamental in deciding on a walking trip (Brown et al., 2007; Corpuz et al., 2005; Yang & Diez-Roux, 2012) and are essential to pedestrian activities and choices (Nuzir & Dewancker, 2016). During a lunch break in Bangkok's CBD, it is observed that, besides going out for a meal, people also have secondary purposes such as socializing while walking, or stopping to shop or for other purposes. Some only come out to buy ready-to-eat meals from food stalls, waiting on the sidewalk for the food before walking back to their workplaces. This behavior of walking as traveling and stopping for interaction is consistent with the findings from Mateo-Babino and Ieda (2007) about movement (mobility) and non-movement acts (waiting or resting for a specific purpose) along a highly active street. The same is true of the findings from Demerath and Levinger (2003) about pausibility or the pause-on-foot concept. Therefore, allowing enough space for various

purposes to support this Asian pedestrian culture that accommodates both activities, in-motion and static, is mandatory to avoid conflict and obstruction.

The sidewalk and its physical environment

The physical environment of sidewalks has been quantitatively studied with respect to their mobility aspects for a long time, but less attention has been given to the issue of how to make them more suitable as they pertain to human factors (Gerike et al., 2021). The fact that pedestrians give high value to walking possibilities indicates that preferences for walking shape pedestrian choices (Shriver, 1997). Without the strong support of scientific evidence, it is a challenge to design attractive and inviting sidewalk spaces that account for mobility roles (movement) and placemaking roles (non-movement) of pedestrian facilities that naturally happen concurrently on the same space (Gerike et al., 2021).

Gehl (2010) concluded that pedestrians should be given priority. The use of narrow public sidewalks of, say, 1.00 m. in width, should be restricted to avoid having them repeatedly being used for commercial activity and creating an undesirable standard (Gerike et al., 2021). A proper width is required to accommodate movement in both directions, allowing pedestrians to move safely and comfortably. On the other hand, a too-narrow sidewalk can become an obstruction or bottleneck, creating a traffic safety issue. This is evident in Cali, Columbia, where vehicles on streets with narrow sidewalks frequently obstruct pedestrian flow (Villaveces et al., 2012). At an average speed, pedestrians react to their walking conditions readily. Residents in Bangkok, especially those living in high-density areas, are specifically concerned about traffic safety due to services provided by motorcycle taxis on the sidewalks (Pongprasert & Kubota, 2017). Besides obstructions and traffic safety, sidewalk surfaces, slope or level changes, weather, and distance are associated with walking behavior. Good condition of the sidewalk surface directly correlates to pedestrians' perceptions of the high accessibility of the sidewalk (Duncan & Mummery, 2005; Gallin, 2001). Slope or level changes pose mobility challenges in hilly areas. To improve accessibility, the level change should be minimized or eliminated (Untermann, 1984). However, in Bangkok, where the terrain is relatively flat, the matter becomes that of avoiding traffic-crossing pedestrian bridges. While these level changes are perceived as an obstruction, crossing at street level is a traffic safety issue (Appleyard, 1980; Buchanan, 1963). The tropical climate of Bangkok combined with high-density development amplifies the urban heat island effect, causing thermal comfort issues (Thammapornpilas, 2015), and walkability is reduced due to increases in radiation and average temperature (Koerniawan & Gao, 2016). Furthermore, street design may influence the environment in the immediate area, including the microclimate, noise, and air pollution (Gerike et al., 2021). Lastly, the distance a pedestrian finds acceptable to travel by foot is considered an essential indicator of walkability. Studies related to TOD and public transportation suggest mixed results that range from 170 m (Soest et al., 2020), to 400 m (Yang & Diez-Roux, 2012), and up to a maximum of 2 km (Sukor & Fisal, 2018). In Bangkok, the number of pedestrians who walk to a mass-transit station within a range of 500-1,000 m. is only 25% due to obstructions and traffic safety issues (Pongprasert & Kubota, 2017).

The physical attributes of the walking infrastructure play an important role in the experience and concerns of pedestrians regarding their walking preferences. These attributes are summarized into six parameters. They are the (i) surface conditions of sidewalks and (ii) sidewalk obstructions (Duncan & Mummery, 2005; Gallin, 2001; Pongprasert & Kubota, 2017; Villaveces et al., 2012), (iii) traffic safety and (iv) level changes (Appleyard, 1980), (v) micro-climate or thermal comfort (Koerniawan & Gao, 2016; Thammapornpilas, 2015), and (vi) walking distance (Soest et al., 2020; Sukor & Fisal, 2018; Yang & Diez-Roux, 2012). Integrated with the information gathered and observed on sites, the six parameters are detailed as follows.

- *The surface condition* of sidewalks refers to the surface quality, damage to material or structure that is problematic for an average walking pace, aesthetic, or attractiveness.

- *Sidewalk obstruction* refers to the sidewalk's ability to allow smooth pedestrian flow, continuing without disturbance or obstruction by various activities or objects. Connectivity problems include effective sidewalk width, improper signage location, supporting facilities and utilities, unlawful occupancy of informal economic activities, food stalls or food trucks, motorcycle-taxi parking, fences, and others. Features providing good accessibility on the sidewalk like ramps, proper curb height, etc., are also included.

- *Traffic safety* refers to the potential cross-circulation or conflict between pedestrians and motor vehicles competing for the same space.

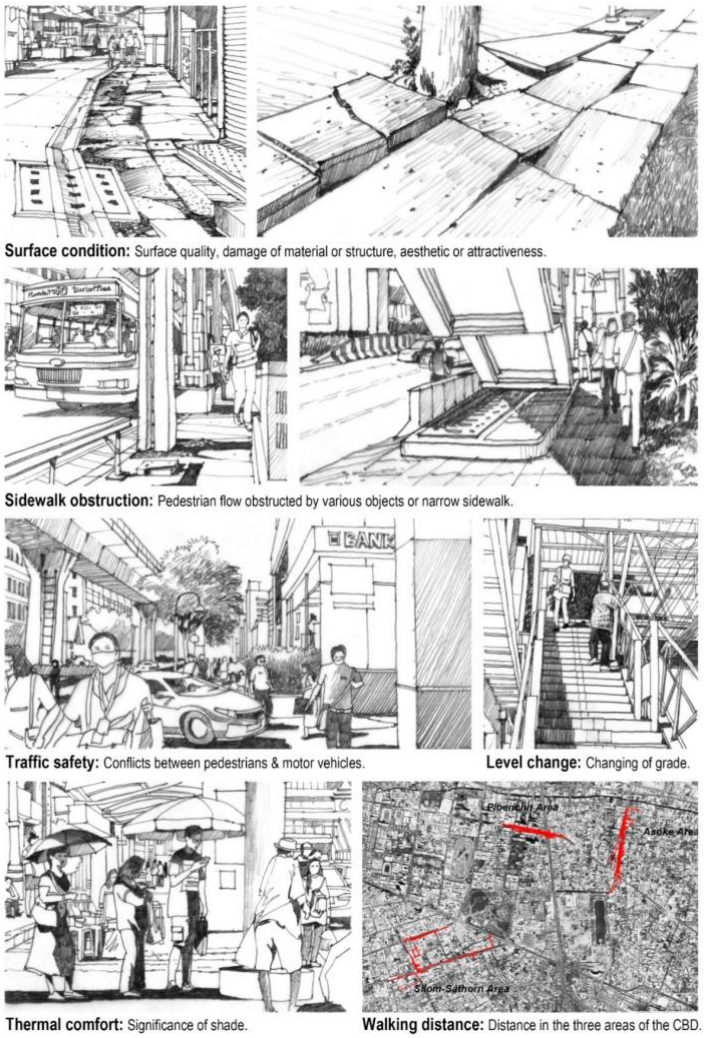
- *Level changes* refers to the vertical movement of pedestrians, such as, for example, traffic-crossing pedestrian bridges, access to an underground tunnel, steep slopes, etc.

- *Thermal comfort* refers to the thermal condition of the sidewalk and the adjacent physical environment, particularly in Bangkok, where the urban heat island effect has strong implications. The physical environment includes surface temperature and radiation from buildings, street trees, shelters, or shading from buildings or structures.

- *Walking distance* refers to the distance of travel on foot by pedestrians from the origin to the destination (Figure 2).

Figure 2

The six physical parameters of the study areas



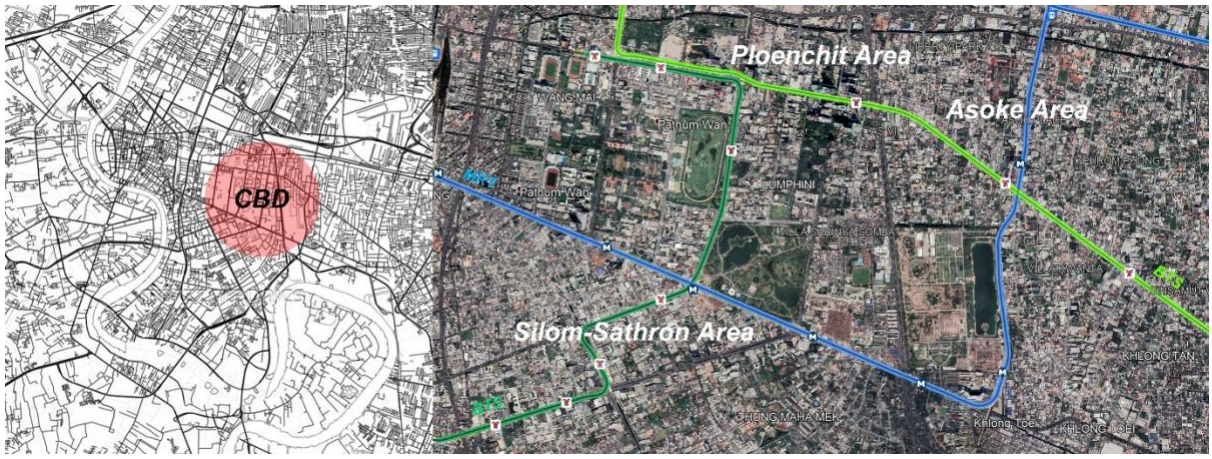
Note. Images showing the six physical parameters of the study areas, which are surface conditions, sidewalk obstructions, traffic safety, level changes, thermal comfort, and walking distance.

STUDY AREA AND RESEARCH FRAMEWORK

Hartman (1950) defines a town or city as the central area that offers services most advantageous to trade and commerce. A “business district” focuses on internal activities that contacts surrounding areas (Hartman, 1950). Silom area has been developed as the central business district (CBD) of Bangkok since after the World War II (1945-2021) (Peerapun et al., 2020). The area has most urban activities and high-density build ups driven by high land development value (Anantsuksomsri & Tontisirin, 2015). Within the densely populated Bangkok CBD, there are three sub-areas where economic activities, social activities, mass-transit systems, and residential areas are concentrated. They are Silom-Sathorn, Ploenchit, and Asoke areas (Tontisirin & Anantsuksomsri, 2021) (Figure 3). These areas are included in the Bangkok Land Use Plan 2013 (2556) by the Bangkok Metropolitan Administration (BMA) as the main business, commercial, services, recreation, and tourism areas, with Floor Area Ratio (FAR) of 10:1, which is the city’s highest (Bangkok Motropolis Administration (BMA, 2013). Mass-transit systems have built their interchange station hubs in these areas, strengthening their commercial, economic, and social activities for more than two decades.

Figure 3

Location of Bangkok’s CBD



Note. Location of Bangkok’s CBD and the three sub-districts, with mass-transit train systems identified. Adapted from *Bangkok Map by BMA 2013, and Bangkok aerial photo by* Google Map, 2021. Copyright 2021 by Google Map.

By site reconnaissance before the study, several food destinations where pedestrians would go during lunch hours were identified. They are categorized as follows: restaurants with air-conditioning, open-air restaurants with mechanical fans, franchise fast food restaurants (all with air-conditioning), street food stalls with only "to-go" options, street food stalls with tables and seats on the sidewalk (or available spots in the area, such as under an elevated highway), and local food clusters or temporary flea markets. Since all lunch places are located along sidewalks, they are an inseparable part of Bangkok's walking experience and urban pedestrian culture.

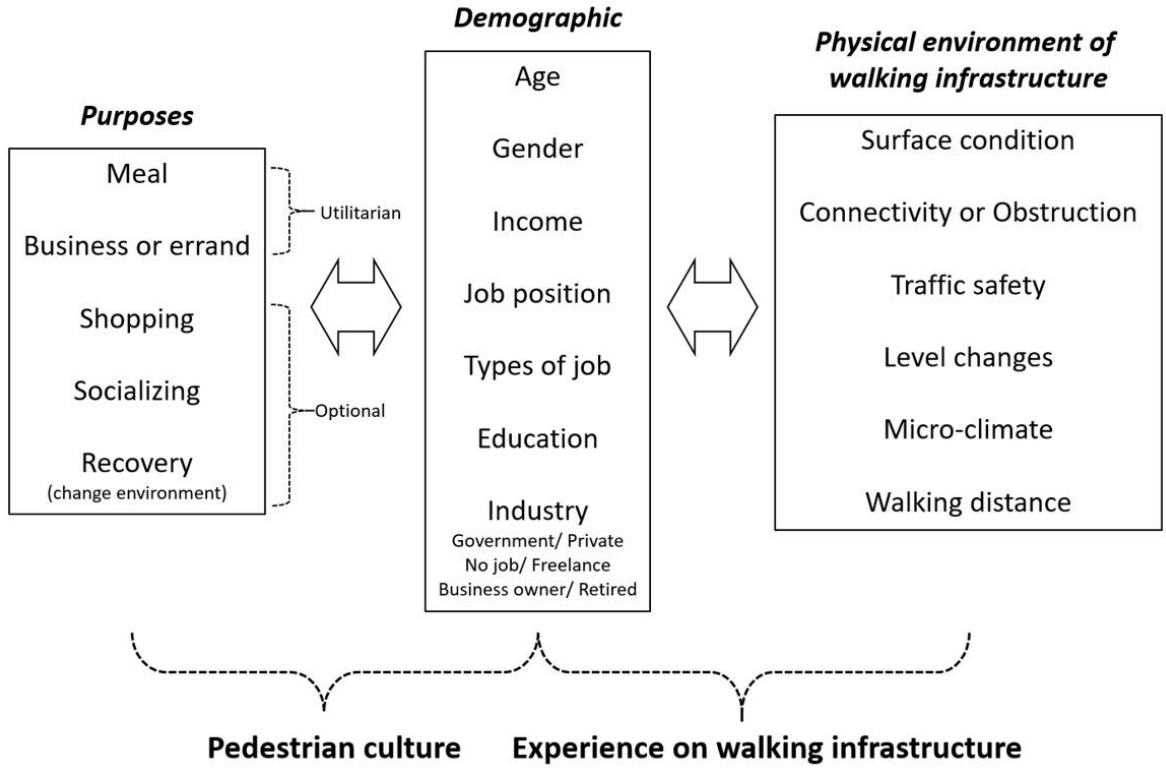
METHODOLOGY

Data from pre-survey observation were collected to form the basis for a questionnaire during the period of September-December 2020. It includes activities, purposes, visited places, walking routes, and physical environment issues. The questionnaire survey was utilized to obtain demographic data, purposes, and information about a pedestrian's experience of the physical environment of the walking infrastructure. The demographic data included age, education, gender, income, occupation, and job position. The purposes were divided into several categories on the questionnaire: lunch, business

or errands, shopping, socializing, or recovery. The physical environments of the walking infrastructure referred to the surface conditions of the sidewalk, sidewalk obstructions, level changes, thermal comfort, and walking distance (Figure 4). The survey was administered in the three sub-districts within the CBD -- Silom-Sathorn, Ploenchit, and Asoke -- at the most concentrated areas of activities: workplaces, lunch places, major sidewalks, and the temporary flea-market clusters. The minimum sample size is 384 for a 95% confidence level, calculated by Cochran's method (Israel, 1992) due to lack of information on latent population. The non-probability sampling method was used for the distribution of the questionnaire survey. The total number of respondents was 536, and among those, 430 respondents walked to their destinations during noon hours. Results from the survey were analyzed by descriptive statistics. The ArcGIS program was used to map the geographic locations of workplaces, destinations, and walk-routes. Hierarchical cluster analysis was used to examine influential physical attributes of the environment that impact pedestrian experiences.

Figure 4

The research framework

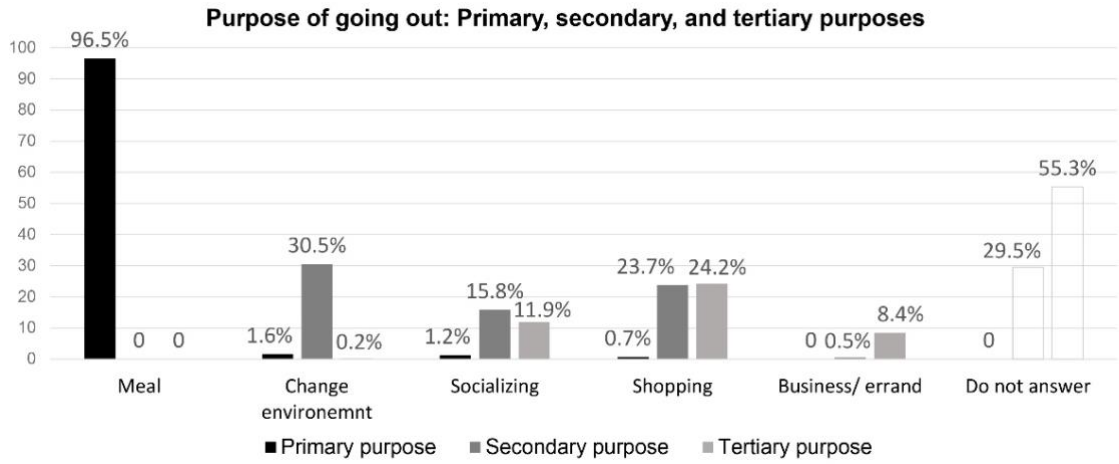


ANALYSIS AND FINDINGS

The results show that 93.5% of the pedestrians come out during the noon break for their lunch (Figure 5). However, besides lunch, they also have other purposes. Of all the pedestrians, 69.4% had secondary purposes: change environment or recovery 30.5%, shopping 23.7%, socializing 15.8%, or business/errands 0.5%, respectively (Figure 5). When asked about any tertiary purposes, 44.9% do shopping, 23.1% socializing, and business/ errands 12.3%/9.3% in order (Figure 5). Hence, the lunch meal is the number one purpose followed by change of environment or recovery, shopping, socializing, and business/ errands.

Figure 5

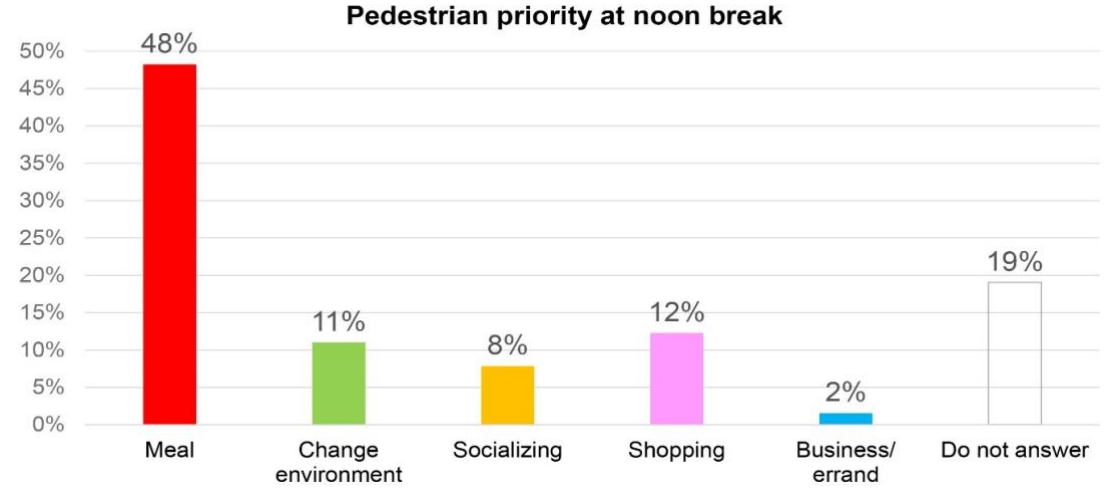
The histogram of the primary, secondary, and tertiary purposes of the surveyed pedestrians.



All of the purposes (primary, secondary, and tertiary) were analyzed further by using the weighted equal interval scale measurement (primary purposes x3, secondary purpose x2, and tertiary purpose x1). The result shows that having a meal is the highest ranked priority or importance (48%). Shopping (12%), change of environment (11%), socializing (8%), and business (2%) follow respectively (Figure 6). Although everyone went out for a meal, the results show that there are always other preferred purposes. Therefore, multiple purposes or activities favored by pedestrians are evident in the pedestrian culture in the CBD of Bangkok during the noon break.

Figure 6

Pedestrian priorities at noon break



A one-way ANOVA analysis was conducted to find out if there was a possible relationship between demographics and purposes. The demographics included age, education, gender, income, job type, and job position. The purposes are 1st (primary), 2nd (secondary), and 3rd (tertiary) purposes, which include meals, change of environment, socializing, shopping, and business or errands. The analysis shows that the relationship between income and 1st purpose (primary purpose) is significant at 0.000 (95% level of confidence) (Table 1). The job type and the 2nd purpose (secondary purpose) are significant at 0.009 (Table 2), and the job type and the 3rd purpose (tertiary purposes) significant at 0.019, respectively (Table 3).

Table 1

The 1st purpose (primary purpose) one-way ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Age	Between Groups	3.490	3	1.163	1.568	.196
	Within Groups	316.001	426	.742		
	Total	319.491	429			
EDU	Between Groups	1.906	3	.635	1.786	.149
	Within Groups	151.557	426	.356		
	Total	153.463	429			
Sex	Between Groups	.889	3	.296	.994	.396
	Within Groups	127.074	426	.298		
	Total	127.963	429			
Income	Between Groups	1178.226	3	392.742	9.426	.000
	Within Groups	17750.148	426	41.667		
	Total	18928.374	429			
Job	Between Groups	3.691	3	1.230	2.317	.075
	Within Groups	226.227	426	.531		
	Total	229.919	429			
Pos	Between Groups	3.978	3	1.326	.481	.696
	Within Groups	1173.874	426	2.756		
	Total	1177.851	429			

Table 2

The 2nd purpose (secondary purpose) one-way ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Age	Between Groups	6.734	4	1.684	2.288	.059
	Within Groups	312.757	425	.736		
	Total	319.491	429			
EDU	Between Groups	1.548	4	.387	1.083	.364
	Within Groups	151.915	425	.357		
	Total	153.463	429			
Sex	Between Groups	.662	4	.165	.552	.697
	Within Groups	127.301	425	.300		
	Total	127.963	429			
Income	Between Groups	403.507	4	100.877	2.314	.057
	Within Groups	18524.868	425	43.588		
	Total	18928.374	429			
Job	Between Groups	7.213	4	1.803	3.441	.009
	Within Groups	222.706	425	.524		
	Total	229.919	429			
Pos	Between Groups	13.679	4	3.420	1.248	.290
	Within Groups	1164.172	425	2.739		
	Total	1177.851	429			

Table 3

The 3rd purpose (tertiary purpose) one-way ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Age	Between Groups	3.406	4	.851	1.145	.335
	Within Groups	316.085	425	.744		
	Total	319.491	429			
EDU	Between Groups	1.894	4	.474	1.328	.259
	Within Groups	151.569	425	.357		
	Total	153.463	429			
Sex	Between Groups	.705	4	.176	.589	.671
	Within Groups	127.258	425	.299		
	Total	127.963	429			
Income	Between Groups	244.132	4	61.033	1.388	.237
	Within Groups	18684.243	425	43.963		
	Total	18928.374	429			
Job	Between Groups	6.294	4	1.574	2.991	.019
	Within Groups	223.624	425	.526		
	Total	229.919	429			
Pos	Between Groups	13.606	4	3.401	1.242	.293
	Within Groups	1164.246	425	2.739		
	Total	1177.851	429			

The results from the ANOVA analysis were further elaborated using the crosstab analysis and the stacked column chart. Among the majority of pedestrians who go out for lunch, 83.6% have monthly income in the range of 15,000-45,000 baht. Within this broad range, specific income groups were as follows: 25,001-35,000 THB per month is 38.6%; 15,000-25,000 THB per month is 30.2%; 35,001-45,000 THB per month is 14.8% (Figure 7). For the surveyed pedestrians who go out with the 2nd purpose (secondary purpose), 59.7% are company employees. Their purposes are 25.5% for changing environment, 21.4% for shopping, and 12.8% for socializing (Figure 8). Similarly, 36.4% of the surveyed pedestrians with tertiary purposes are company employees. Their purposes are 18.8% for shopping, 10% for socializing, and 7.6% for business (Figure 9).

Figure 7

The Crosstab and histogram of pedestrians by income and primary purpose

		Lunch	Change environment	Socializing	Shopping	Total
Income	lower than 15,000	17	0	0	0	17
	15,000-25,000	130	3	1	2	136
	25,001-35,000	166	3	1	0	170
	35,001-45,000	64	0	1	1	66
	45,001-55,000	20	0	1	0	21
	55,001-75000	11	0	0	0	11
	75,001-100,000	4	0	1	0	5
	100,000-200,000	2	0	0	0	2
	Do not answer	1	1	0	0	2
Total		415	7	5	3	430

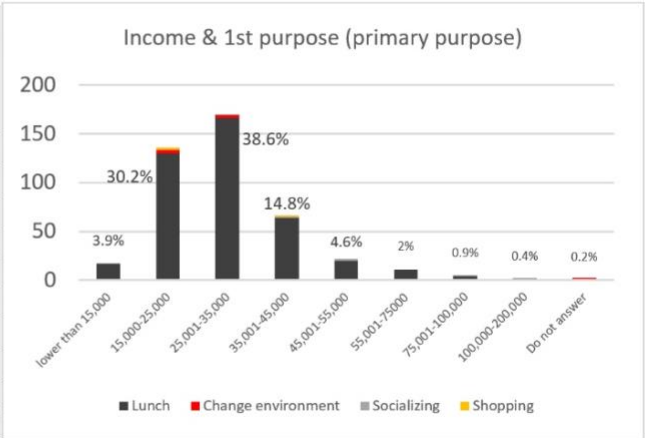


Figure 8

The Crosstab and histogram of pedestrians by job types and secondary purpose

		Change environment	Socializing	Shopping	Business	No answer	Total
Job type	Labor/ Contractor	7	4	1	1	2	15
	Merchant	2	0	0	0	3	5
	Government	11	8	7	0	12	38
	Company employee	110	55	92	1	107	365
	Retired	0	1	0	0	0	1
	Do not work	0	0	0	0	1	1
	Others	1	0	2	0	2	5
Total		131	68	102	2	127	430

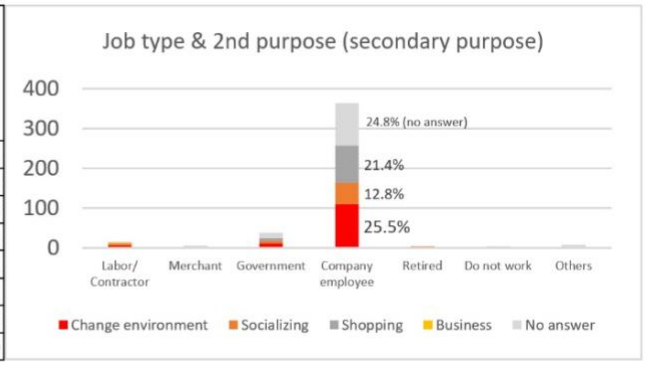
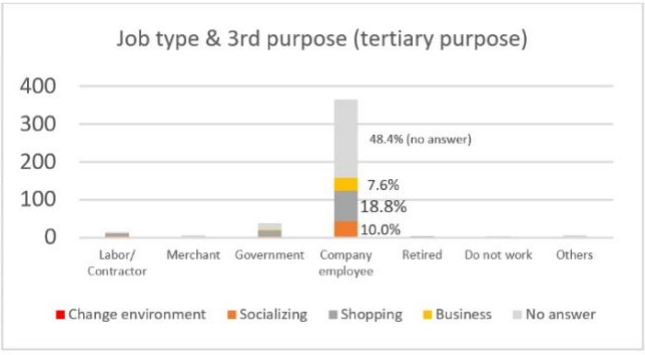


Figure 9

The Crosstab and histogram of pedestrians by job types and tertiary purpose

		Change environment	Socializing	Shopping	Business	No answer	Total
Job type	Labor/ Contractor	0	4	7	0	4	15
	Merchant	0	0	1	0	4	5
	Government	1	3	14	2	18	38
	Company employee	0	43	81	33	208	365
	Retired	0	0	1	0	0	1
	Do not work	0	0	0	0	1	1
	Others	0	1	0	1	3	5
Total		1	51	104	36	238	430



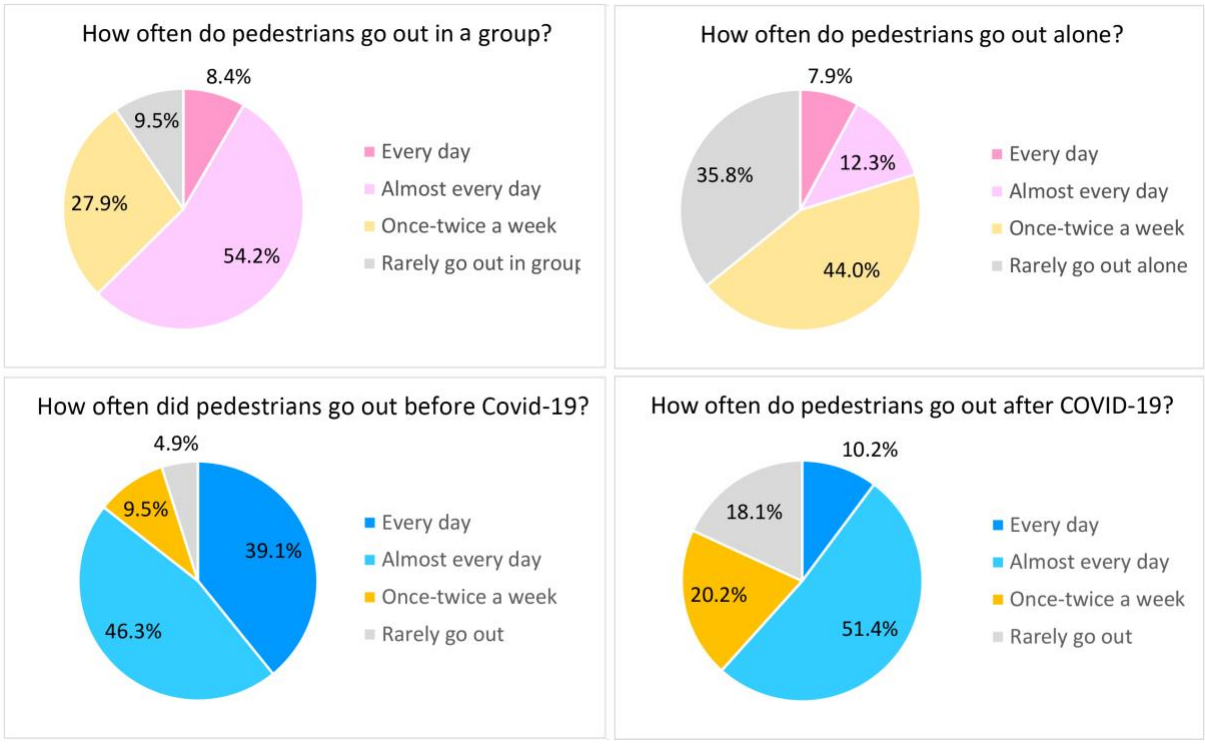
This study also examined the frequency of group behavior among pedestrians during the lunch hours. The results demonstrate that pedestrians go out in groups: everyday (8.4%), almost every day (54.2%), once or twice a week (27.9%), or rarely go out (9.5%). For pedestrians who go out alone, the results are: every day (7.9%), almost every day (12.3%), once or twice a week (44%), or rarely go out alone (35.8%) (Figure 10). In total, 90.5% of pedestrians went out in groups. The results show that going out as a group is a part of the urban pedestrian culture in the CBD of Bangkok.

After the initial wave of COVID-19 in early 2020, most pedestrians still went out for their lunch-trips, as compared to their pre-pandemic routines. In comparing between the before-after situations, the proportion of pedestrians who went out *every day* was 39.1%-10.2%, *almost every day* was 46.3%-51.4%, *once-twice a week* was 9.5%-20.2%, and *rarely go out* was 4.9%-18.1% (Figure 10). It is noted that the proportion of pedestrians who went out *every day* reduced from 39.1% before the pandemic to 10.2% after. However, pedestrian outings that occurred *almost every day* or *once-twice a week* increased from 46.3% to 51.4% and from 9.5% to 20.2%, respectively. In summary, when considering before-after the pandemic, pedestrians went out 94.9%-81.8%.

(Note: Covid-19 was reported the first time in Bangkok, Thailand, in January 2020. The initial wave of infection peaked in March, and a curfew was posted in April, and then lifted in July 2020. The survey results of this study were obtained during the period of September-December 2020. There were subsequent outbreaks (or infection "waves") that began in December 2020 and April 2021).

Figure 10

The frequency pie charts of pedestrian outdoor lunch trips

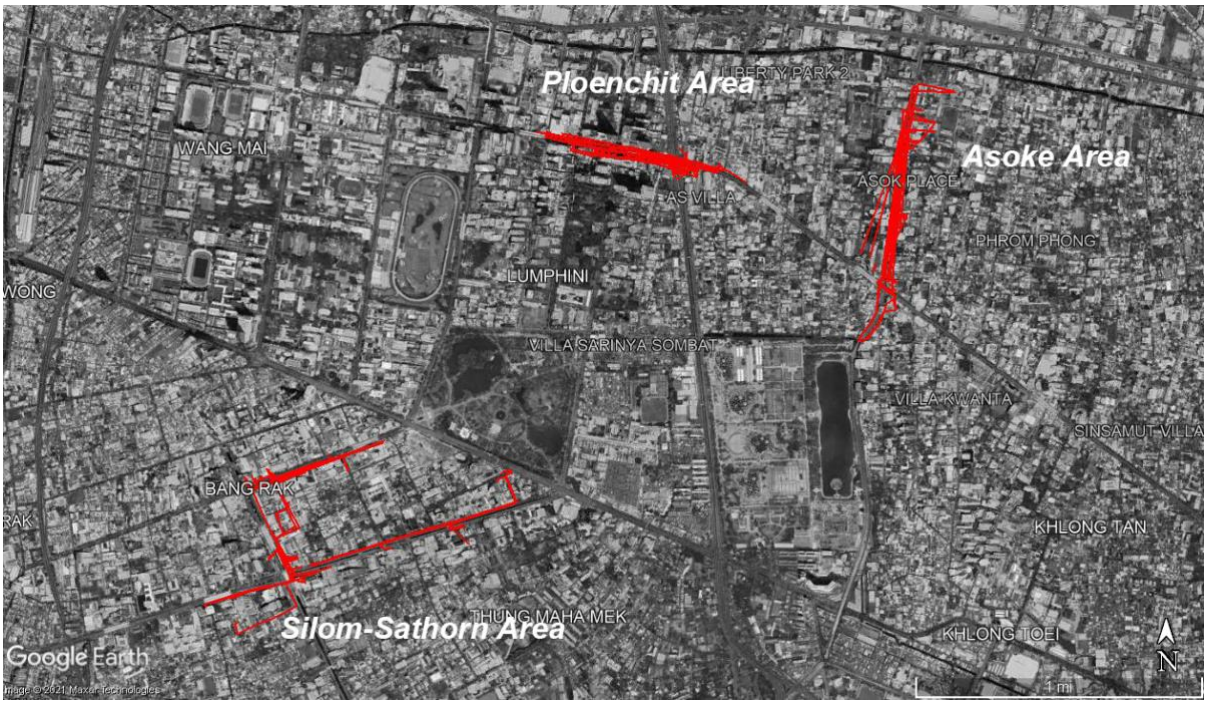


Note. Frequency pie charts of pedestrian outdoor lunch trips as groups and alone (top row) and the frequency pie charts for before and after the COVID-19 pandemic in 2020 (bottom row).

Pedestrian paths and the distribution of workplaces and lunch places were mapped using ArcGIS based on the results from the questionnaire survey. In the Silom-Sathorn area, recorded workplaces are scattered, encompassing an area of approximately 1,800. m x 650 m. However, the lunch places are clustered in groups, some of them about the internal area of the city blocks. In the Ploenchit area, the workplaces and lunch places spread along both sides of the main road (Rama I Road) in a linear form, approximately 1,300 m. in length. The workplaces and lunch places in the Ploenchit area are in close proximity to each other. And lastly, in the Asoke area, the workplaces are located along the main road (Asoke Road), approximately 1,400 m. in length, similar to the Ploenchit area. However, the lunch places cluster at spots along the road to the north and the south, similar to that of Silom-Sathorn (Figure 11 and 12).

Figure 11

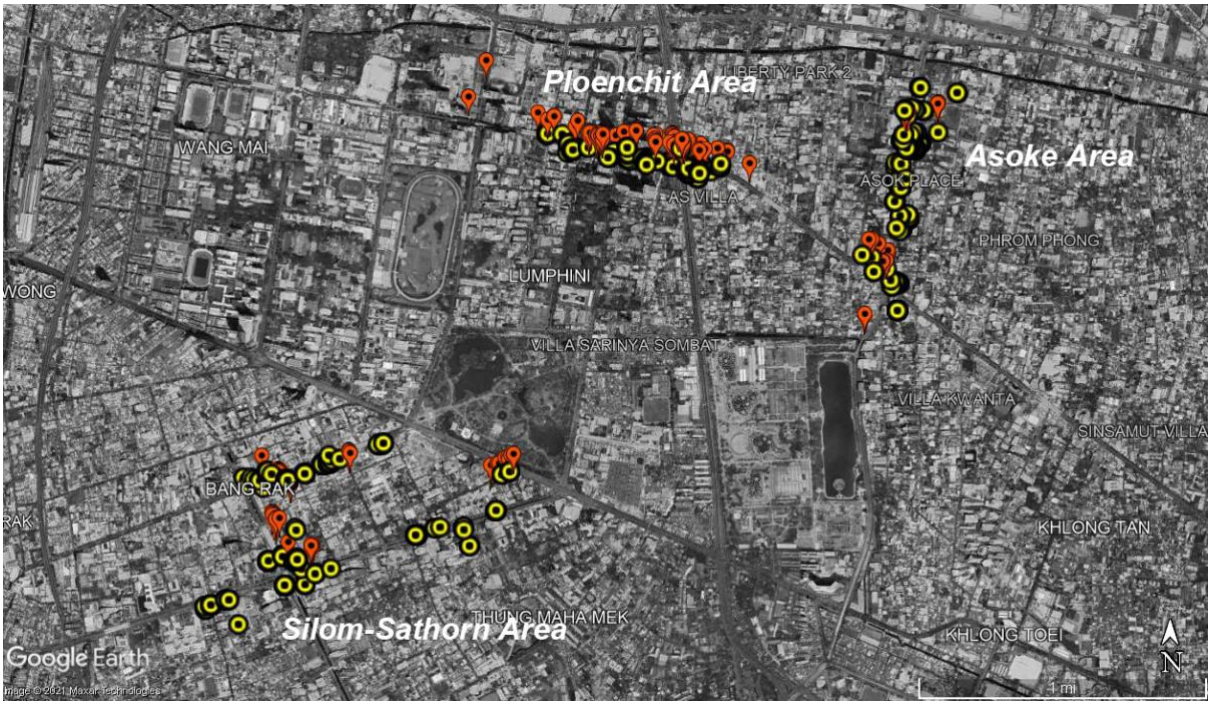
The pedestrian paths (red lines) *during lunch hours in the 3 areas.*



Note. Adapted from *Bangkok aerial photo,* by Google Earth, 2021. Copyright 2021 by Google Earth.

Figure 12

The distribution of walking places (yellow dots) and lunch places (orange dots)

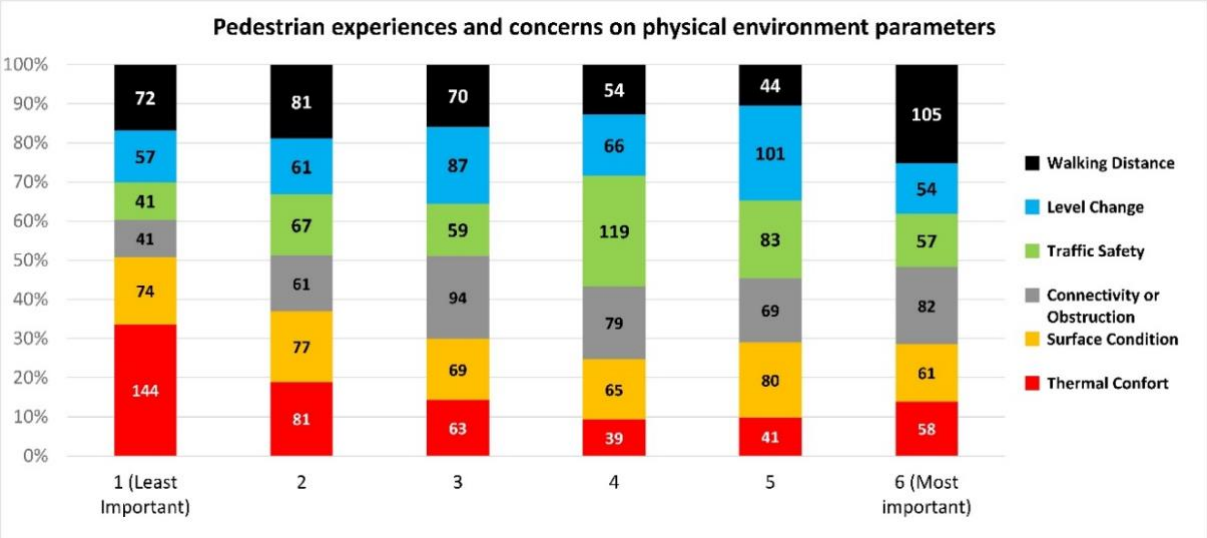


Note. Adapted from *Bangkok aerial photo,* by Google Earth, 2021. Copyright 2021 by Google Earth.

The results relate to pedestrians' experiences of the physical environment were obtained from pedestrians' answers to the question, "What physical parameters do you consider when deciding to go out during the noon hours?" The parameters are thermal comfort, pavement surface conditions, sidewalk obstructions, traffic safety, level changes, and walking distance, and the pedestrians were asked to rank the level of importance of each parameter on a 6-point rating scale ranging from the least important (1) to the most important (6). The resulting histogram shows a mixture of concerns regarding various parameters across the board (Figure 13). Walking distance and thermal comfort dominate at the extremes; walking distance was ranked as the most important 105 times, while thermal comfort was ranked as the least important 144 times. However, considering the overall picture of the more important concern, measured by adding scores from the scale of 4 to 6, traffic safety is the most important concern parameter (259), following by sidewalk obstructions (240), level changes (221), surface conditions (206), walking distance (203), and thermal comfort (138). This mixed result prompted further investigation.

Figure 13

The stacked column of experiences and concerns about physical parameters



Hierarchical cluster analysis was used to further examine the character of pedestrian's experiences or concerns regarding their physical environment. Pedestrians' concerns and experiences are grouped into five clusters, graphically illustrated as a dendrogram (Figure 14) that groups all observations (n=430) of concerns or experiences regarding physical parameters of the sidewalk into a hierarchy of clusters. Each cluster broadly represents similarity within itself but is distinct or different from other clusters. The analysis divided all observations into two clusters, three clusters, and five clusters respectively (Figure 14). The five-cluster division was chosen to be further investigated by using a line chart to see the patterns of concerns or experiences, followed by the stacked column charts to find prominent physical parameters from each cluster (Figure 15).

Figure 14

The dendrogram of office workers' concerns regarding the physical parameters

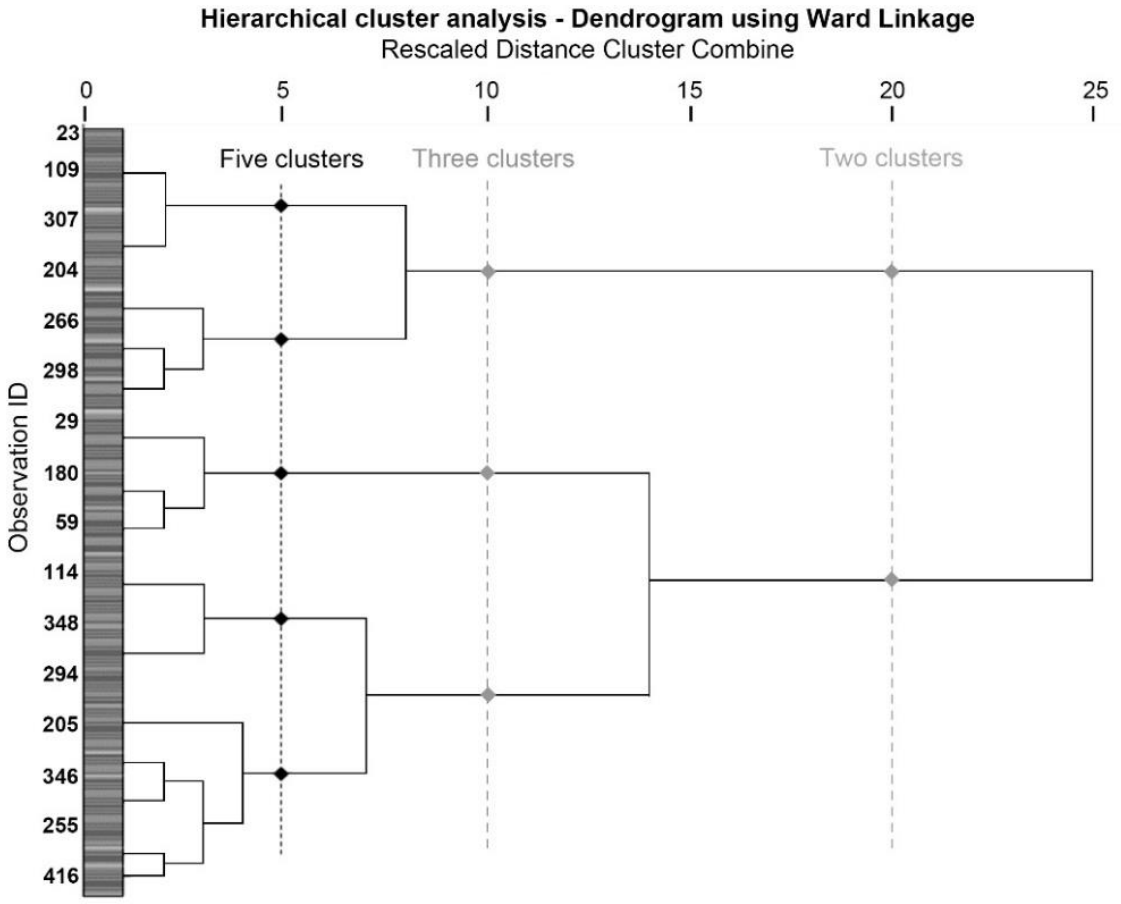
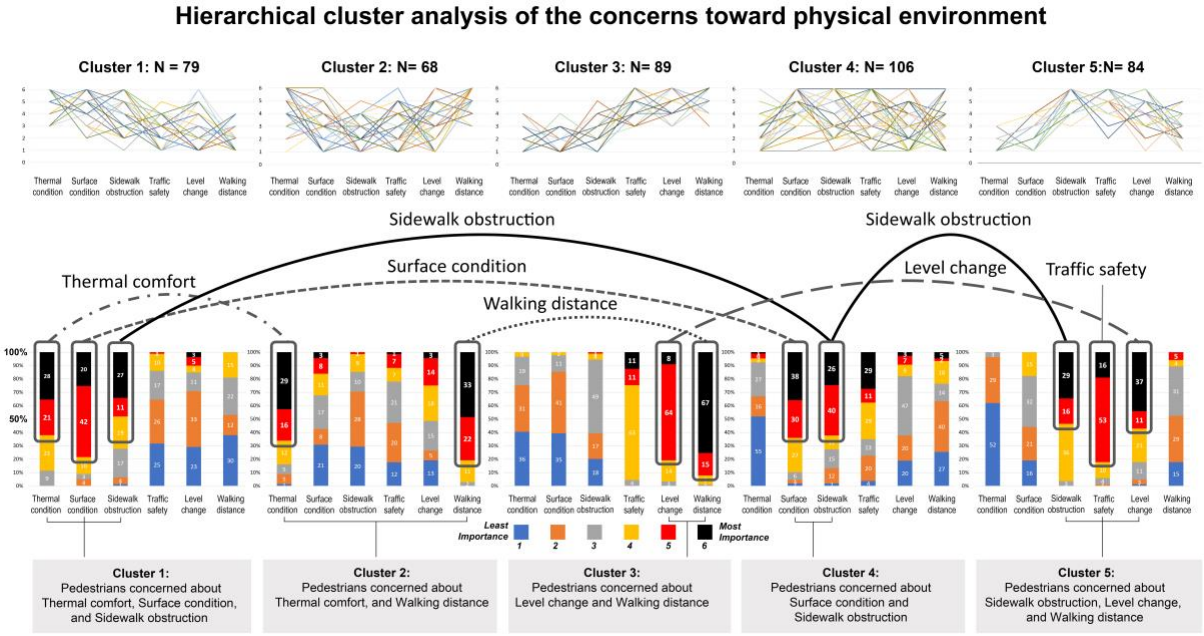


Figure 15

Descriptive statistics of the five clusters, their relationships, and common features



The hierarchical cluster analysis found different patterns of how pedestrian perceived their walking environment among the five clusters. Considering the majority of responses (over 50%) of all parameters, the dominant parameters from each cluster were identified as follows: Cluster 1, people concerned about thermal conditions, pavement surface conditions, and sidewalk obstructions. Cluster 2, people concerned about thermal conditions and walking distance. Cluster 3, people concerned about level changes and walking distance. Cluster 4, people concerned about pavement surface conditions and sidewalk obstructions. Cluster 5, people concerned about sidewalk obstructions, traffic safety, and level changes (Figure 15). From the dominant parameters of each cluster, similarities among all clusters were identified and arranged in a table in order to understand their common features and create an overall picture of the concerns (Table 4).

Table 4

Pedestrian concerns about specific physical environment parameters ranked on a 6-point rating scale

Number of pedestrians concerning toward physical environment

	Cluster 1: Thermal comfort, Surface condition, and Sidewalk obstruction						**Cluster 2:** Thermal comfort and Walking distance						**Cluster 3:** Level change and Walking distance						**Cluster 4:** Surface condition and Sidewalk obstruction						**Cluster 5:** Sidewalk obstruction, Traffice safety, and Level change					
Rating scale	Thermal comfort	Surface condition	Sidewalk obstruction	Traffic safety	Level change	Walking distance	Thermal comfort	Surface condition	Sidewalk obstruction	Traffic safety	Level change	Walking distance	Thermal comfort	Surface condition	Sidewalk obstruction	Traffic safety	Level change	Walking distance	Thermal comfort	Surface condition	Sidewalk obstruction	Traffic safety	Level change	Walking distance	Thermal comfort	Surface condition	Sidewalk obstruction	Traffic safety	Level change	Walking distance
1 (the least important)			1	25	23	30	1	21	20	12	13		36	35	18				55	2	2	4	20	27	52	16			1	15
2		4	4	26	33	12	5	8	28	20	5		31	41	17				16	3	12	20	20	40	29	21		1	3	29
3	9	3	17	17	11	22	5	17	10	21	15	2	19	11	49	4	3	1	27	6	15	13	47	14	3	32	3	4	11	31
4	21	10	19	10	4	15	12	11	9	7	18	11	3	2	4	63	14	6	3	27	11	29	9	18		15	36	10	21	4
5	**21**	**42**	**11**	1	5		**16**	8	1	7	14	**22**			1	11	**64**	**15**	4	**30**	**40**	11	7	2			**16**	**53**	**11**	5
6 (the most important)	**28**	**20**	**27**		3		**29**	3		1	3	**33**				11	**8**	**67**	1	**38**	**26**	29	3	5			**29**	**16**	**37**	

Adding together the number of office workers from all clusters who have common concerns ranked at 5 or 6 on the rating scale (the most important), the most concern about the physical environment is sidewalk obstructions (n= 149; 11+27+40+26+16+29). The other concerns, in descending order are walking distance (n=137; 22+33+15+67), pavement surface conditions (n=130; 42+20+30+38), level changes (n=120; 64+8+11+37), thermal comfort (n=94; 21+28+16+29), and traffic safety (n=69; 53+16).

DISCUSSION

Besides having lunch at the noon break, the lunchtime behavior of urban pedestrians in Bangkok includes a combination of several secondary purposes or activities. The majority of pedestrians (69.4%) indicated that they did have secondary purposes, including recovery or refreshing themselves from work (30.5%), shopping (23.7%), or socializing (15.8%), while a small number of pedestrians (0.5%) had errands or business reasons (Figure 5). Furthermore, 44.9% of pedestrians had tertiary purposes: shopping 24.2%, socializing 11.9%, business/ errands 8.4%, or change of environment 0.2% (Figure 5). Not only do pedestrians have multiple purposes in mind, but 90.5% of pedestrians also went out in groups at least once per week. This is a strong indicator of pedestrians' preference for socializing. By weighted equal interval scale measurement (Figure 6), pedestrians favor multiple purposes when going out for their noon breaks. This can be described as their urban pedestrian culture.

The results from the ANOVA analysis indicate a significant relationship between income and the primary purpose, which is the meal (Table 1). The majority of pedestrians who went out for the meal have incomes ranging from 15,000-25,000 (entry level 1) and 25,001-35,000 (entry level 2) to 35,001-45,000 (mid-level) (Figure 7). In combination, these three income groups

represent 83.6% of all pedestrians surveyed. Beside income, job type also has significant relationship with the secondary and tertiary purposes (Table 2 and 3). The pedestrians with secondary and tertiary purposes were employees who work for corporations and companies in the CBD (Figure 8 and 9). In conclusion, the commercial activities of providing food and goods at affordable prices, ranging from street vendors to flea markets, are compatible with most pedestrians who have incomes at the entry-mid level range and work as company employees. They benefit, support, and sustain each other, creating a pedestrian culture eco-system.

Since the fieldwork of this study was conducted during the late months of 2020, the frequency of outdoor activities during the lunch hours was explored with respect to the impact of the COVID-19 situation. The results indicate only a slight decline of lunch outings during the time period of the survey. The majority of pedestrians still went out for their lunch trips compared to their pre-pandemic routines. In comparing before and after behaviors, the percentages were: go out every day 39.1%-10.2%, almost every day 46.3%-51.4%, once-twice a week 9.5%-20.2%, and rarely go out 4.9%-18.1% (Figure 10). Overall, the percentages of pedestrians going out compared to before and after the Covid-19 outbreak were 95.1%:81.9%. Therefore, the decline in the frequency of pedestrian outings due to the initial round of the pandemic in Bangkok was insignificant.

On the sidewalks of Bangkok's CBD, shops, restaurants, and commercial activities can be found throughout all areas, including the informal commercial sector such as street vendors on the major sidewalks, or flea markets accessible from the sidewalks. For the pedestrians, it is necessary to integrate all their purposes into the short time frame of their lunch hours; therefore, pedestrians prefer the inclusion of multiple activities into the urban pedestrian culture of Bangkok.

All of these activities occupying the same urban space are an indication of economic opportunities and social interaction that happen simultaneously on the sidewalks, requiring the space to support both uses, circulation as well as providing space for interaction (Mateo-Babino & Ieda, 2007). Although the intensity of major sidewalk usage during lunch hours is very high (Figures 11 and 12), the walking infrastructure and physical environment supporting this demand might be in deficit (Figure 1 and 2).

The frequency stacked column chart of concerns-experiences regarding the physical parameters of the walking infrastructure is inconclusive (Figure 13). Although thermal comfort and walking distance dominate at the opposite ends of the spectrum, the least important (1) and the most important (6), other parameters (surface conditions, sidewalk obstruction, traffic safety, and level changes) show mixed outcomes. As a result, the nature of the pedestrians' experiences or concerns about their physical environment was investigated further using hierarchical cluster analysis (Figure 14). Based on this analysis, the pedestrians were divided into five clusters (Figure 15). Even though each cluster has its own pattern of concerns, some common concerns among all clusters are noticeable (Table 4). The outcomes demonstrate that *sidewalk obstruction (n=149)* is the most concerning feature among pedestrians. The following concerns are ranked from higher to a lower value: *walking distance (n=137), surface conditions (n=130), level changes (n=120), thermal comfort (n=94)*, and *traffic safety (n=69)*. The constant hot climate of Bangkok was expected to be the most concerning parameter. Instead, it was found to be less of a concern since the outdoor temperature is beyond personal control. The hot outdoor temperature is always anticipated and accepted. Traffic safety is also less of a concern because pedestrians become dominate tight and narrow walking paths of Bangkok’s CBD during lunch hours. This finding is consistent with many previous studies; for example, it has been repeatedly found that the physical environment impacts people's experience and preference toward their outdoor surroundings (Appleyard, 1980; Brown et al., 2007; Cervero et al., 2009; Gallin, 2001; Horning et al., 2008; Mehta, 2008; Sukor & Fisal, 2018; Villaveces et al., 2012). Therefore, it is unsurprising that all of these concerns about the physical environment of the sidewalk affect walking behavior and preferences.

Improvement of the sidewalk and its physical environment is vital to sustaining the urban pedestrian culture, economic benefits, and social interaction. Physical parameters of high concern should be given priority, while the less

concerning ones could be phased in to comply with potential and limitations. According to the results, prioritized improvement of physical parameters in the CBD are the following: removing or mitigating sidewalk obstruction, improving infrastructure to minimize concerns about walking distance, enhancing surface conditions, minimizing level changes, offering better thermal comfort, and greater traffic safety, respectively.

Sidewalk obstruction is the most significant concern for walkability. By site observation, this problem persists due to two primary causes: 1) the interruption of the pedestrian traffic flow on a sidewalk that has insufficient space or is too narrow to accommodate multiple activities (Figure 1), and 2) utility infrastructure located on the sidewalks in such a way that it blocks the flow. Sometimes, the walking infrastructure itself creates blockages (Figure 2); for example, the landing area of a traffic-crossing pedestrian bridge that overlaps a tree pit or utility equipment located in the middle of a sidewalk creates an uncomfortable obstacle or bottleneck. Suggested revitalizing strategies for mitigating sidewalk obstructions include widening the sidewalk, modifying arrangement of utility objects, management and arrangement of street vendor locations at the transit hubs, entries, or places with constant pedestrian traffic, and upgrading and managing sidewalk amenities such as signs, seats, etc.

Walking distance, however, relies on the cumulative effects of improvements on other parameters. As a result, walking possibilities increase, and pedestrians may choose to walk farther. Additionally, sidewalks should be well maintained and well protected to relieve the concerns of *surface conditions*.

Level changes and *traffic safety* can be addressed at crosswalks and pedestrian bridges. Although level separation significantly impairs pedestrian access (Untermann, 1984), pedestrian bridges should be located to accommodate the connectivity of important pedestrian flows and minimize pedestrian-vehicle conflicts. At major traffic-crossing pedestrian bridges, escalators could be considered to maximize their use and minimize street-level crossing.

Thermal comfort can be mitigated by planning for large canopy trees. For a newly initiated projects, developers are being encouraged, through government incentives, to dedicate space adjacent to the public sidewalk for expanding its utilitarian width and planting shading trees. Thoughtful arrangement of the building's orientation or the urban block can also create shade and shadow for public sidewalks.

CONCLUSIONS

The urban pedestrian culture in Bangkok is defined by its multi-purpose nature, which is preferred by users with entry to mid-level income that comprise the majority of street users. Most Thais also like to go out in groups for a meal, shopping, change of environment for recovery, or socializing. The arrival of the pandemic's initial wave of infection (March-August 2020) reduced the number of outings for pedestrians only slightly (from 94.9%-81.8%). This is an indicator that outings with friends or coworkers are strongly embedded in the Thai urban pedestrian culture. Well-known among Thais who work in the CBD is the fact that most people eat out. This lunch hour outing creates social interactions among pedestrians and leads to informal economic activities along the pathways, especially with food and flea market vendors. Although the pandemic's impact on pedestrian outings was insignificant in the early to middle of 2020, there were subsequent outbreaks in December 2020 and April 2021, and pandemic concerns have continued into late 2021. Behavioral changes can be anticipated if the pandemic continues to be prolonged. Future studies regarding this aspect shall be required.

Among all the physical qualities impacting pedestrians' experiences, sidewalk obstruction plays the most critical role, while thermal condition is not as important as had been expected. Thais know that the is the city sidewalks are hot, and it is common to hear "too hot to go out" or complaints about the heat; however, while pedestrians have alternatives of walking routes, distances, pavement surface conditions, and others, thermal comfort is not a choice but an accepted condition by default. Surface conditions and level changes are also

critical. A good pavement surface provides smooth mobility without potential accidents. Strategically located traffic-crossing pedestrian bridges or crosswalks that allow direct connections between major sidewalks encourage the usage rather than saving time and risking any injuries by crossing at street level due to improper location of these bridges or crosswalks. Improvements in the physical qualities of the walking infrastructures would increase walking distance naturally. Design considerations should incorporate pedestrian and sidewalk design that combines and maximizes the synergy of all activities (Gerike et al., 2021) to create flexible and sustainable pedestrian routes. In the case of Bangkok, the improvement of urban spaces, including streets and sidewalks, is multi-disciplinary. It is vital to bring all involved stakeholders together and revisit codes and regulations at the policy level. In this way, the commercial urbanism and pedestrian culture unique to Thailand will be promoted and sustained.

ACKNOWLEDGMENTS

The authors would like to thank the research support team at Regional, Urban, and Built Environment Analytics, Faculty of Architecture, Chulalongkorn University, namely, Korrakot Positlimpahul and Areen Phuntarakit.

REFERENCES

Anantsuksomsri, S., & Tontisirin, N. (2015). The impacts of mass transit improvements on residential land development values: Evidence from the Bangkok Metropolitan Region. *Urban Policy and Research*, *33*(2), 195–216. https://doi.org/10.1080/08111146.2014.982791

Appleyard, D. (1980). Livable streets: Protected neighborhoods? *The Annals of the American Academy of Political and Social Science*. https://doi.org/10.1177/000271628045100111

BMA. (2013). *Bangkok Landuse Plan 2556*. Department of City Planning and Urban Development. http://www.bangkok.go.th/cpud/page/sub/18991/ผังเมืองรวมกรุงเทพมหานคร-พศ2556

Brown, B. B., Werner, C. M., Amburgey, J. W., & Szalay, C. (2007). Walkable route perceptions and physical features. *Environment and Behavior*, *39*(1), 34–61. https://doi.org/10.1177/0013916506295569

Buchanan, C. (1963). *Traffic in towns: A study of the long-term problems of traffic in urban areas*. Waterlow & Sons Ltd.

Burton, E., & Mitchell, L. (2006). *Inclusive urban design: Streets for life* (1st ed.). Routledge. https://doi.org/https://doi.org/10.4324/9780080456454

Cervero, R., Sarmiento, O. L., Jacoby, E., Gomez, L. F., & Neiman, A. (2009). Influences of built environments on walking and cycling: Lessons from Bogotá. *International Journal of Sustainable Transportation*, *3*(4), 203–226. https://doi.org/10.1080/15568310802178314

Corpuz, G., Hay, A., & Merom, D. (2005). Walking for transport and health: Trends in Sydney in the last decade. *28th Australasian Transport Research Forum, ATRF 05*, 1–15.

Demerath, L., & Levinger, D. (2003). The social qualities of being on foot: A theoretical analysis of pedestrian activity, community, and culture. *City & Community*, *2*(3), 217–237. https://doi.org/10.1111/1540-6040.00052

Demerouti, E., Bakker, A. B., Geurts, S. A. E., & Taris, T. W. (2009). Daily recovery from work-related effort during non-work time. In *Research in Occupational Stress and Well Being* (Vol. 7, Issue 2009). Elsevier. https://doi.org/10.1108/S1479-3555(2009)0000007006

Duncan, M., & Mummery, K. (2005). Psychosocial and environmental factors associated with physical activity among city dwellers in regional Queensland. *Preventive Medicine*, *40*(4), 363–372. https://doi.org/10.1016/j.ypmed.2004.06.017

Gallin, N. (2001). Quantifying pedestrian friendliness - guidelines for assessing pedestrian level of service. *Road and Transport Research*, *10*(1), 47–55.

Gehl, J. (2010). *Cities for people*. Island Press.

Gehl, J. (2011). *Life between buildings: Using public space* (Vol. 8, Issue 1). Island Press. https://doi.org/10.3368/lj.8.1.54

Gerike, R., Koszowski, C., Schröter, B., Buehler, R., Schepers, P., Weber, J., Wittwer, R., & Jones, P. (2021). Built environment determinants of pedestrian activities and their consideration in urban street design. *Sustainability*, *13*(16), 9362. https://doi.org/10.3390/su13169362

Hartman, G. W. (1950). The Central Business District-A study in urban geography. *Economic Geography*, *26*(4), 237–244. https://doi.org/10.2307/141260. JSTOR 141260

Horning, J., El-Geneidy, A., & Krizek, K. J. (2008). Perceptions of walking distance to neighborhood retail and other public services. *Transportation Research Board 87th Annual Meeting Compendium of Papers*, *January 13-17*, *2008*, *Washington*, *DC.* https://www.researchgate.net/publication/229051014_Perceptions_of_walking_distance_to_neighborh%0Aood_retail_and_other_public_services

Israel, G. D. (1992). *Determination of sample size*. University of Florida Cooperative Extension Service, Institute of Food and Agriculture Sciences, EDIS.

Koerniawan, M. D., & Gao, W. (2016). Investigation and evaluation of thermal comfort and walking comfort in hot-humid climate case study: The open spaces of Mega Kuningan-Superblock in Jakarta. *International Journal of Building, Urban, Interior and Landscape Technology (BUILT)*, *6*(July), 53–72.

Lo, R. H. (2009). Walkability: What is it? *Journal of Urbanism*, *2*(2), 145–166. https://doi.org/10.1080/17549170903092867

Mateo-Babiano, I. (2009). Redefining the Asian space: A comparative view of evolving street culture and pedestrian space development in Bandung, Bangkok and Manila. In *Asian Transformations in Action: The work of the 2006/2007 API Fellows* (1st ed., pp. 214–223). The Nippon Foundation.

Mateo-Babino, I., & Ieda, H. (2007). Street space sustainability in Asia: The role of the Asian pedestrian and street culture. *Journal of the Eastern Asia Society for Transportation Studies*, *7*, 1915–1930. https://doi.org/10.11175/eastpro.2007.0.242.0

Mehta, V. (2008). Walkable streets: Pedestrian behavior, perceptions and attitudes. *Journal of Urbanism*, *1*(3), 217–245. https://doi.org/10.1080/17549170802529480

Nonthapot, S. (2019). The impact of economic factors on street food consumer choice in Nong Khai municipality, Nong Khai province, Thailand. *Management Science Letters*, *9*(Special Issue 13), 2337–2346. https://doi.org/10.5267/j.msl.2019.7.021

Nuzir, F. A., & Dewancker, B. J. (2016). Redefining place for walking: A literature review and key-elements conception. *Theoretical and Empirical Researches in Urban Management*, *11*(1), 59–76.

Pasciana, R., Pundenswari, P., & Sadrina, G. (2020). Street vendor management in Indonesia and Thailand. In *Managing Learning Organization in Industry 4.0* (pp. 272–278). Routledge. https://doi.org/10.1201/9781003010814-49

Peerapun, W., Sereerat, S., Sanit, P., Vichienpradit, P., & Wi-Te, Y. (2020). Master planning for conservation and development of krung rattanakosin 2032. *Nakhara: Journal of Environmental Design and Planning, 19*, 39-59. https://doi.org/10.54028/nj2020193958

Pongprasert, P., & Kubota, H. (2017). Switching from motorcycle taxi to walking: A case study of transit station access in Bangkok, Thailand. *IATSS Research*, *41*(4), 182–190. https://doi.org/10.1016/j.iatssr.2017.03.003

Resuloğlu, Ç. (2020). Is it possible to re-design livable urban streets? In S. Şatır (Ed.), *Academic Studies in Architecture, Planning and Design-II* (1st ed., pp. 87–99). Gece Publishing. https://www.gecekitapligi.com/Webkontrol/uploads/Fck/Architecture_yayin_1.pdf#page=93

Saswattawong, T. (2009). *Lunching behavior of working persons in Mueang Chiang Mai district individual research in the program of Master of Business Admiration*. Chiangmai University.

Shriver, K. (1997). Influence of environmental design on pedestrian travel behavior in four Austin neighborhoods. *Transportation Research Record, 1578*, *1*(961076), 64–75. https://doi.org/10.3141/1578-09

Soest, D. V., Tight, M. R., & Rogers, C. D. F. (2020). Exploring the distances people walk to access public transport. *Transport Reviews*, *40*(2), 160–182. https://doi.org/10.1080/01441647.2019.1575491

Sueur, C., Class, B., Hamm, C., Meyer, X., & Pelé, M. (2013). Different risk thresholds in pedestrian road crossing behaviour: A comparison of French and Japanese approaches. *Accident Analysis and Prevention*, *58*, 59–63. https://doi.org/10.1016/j.aap.2013.04.027

Sukor, N. S. A., & Fisal, S. F. M. (2018). Factors influencing the willingness to walk to the bus stops in Penang Island. *Planning Malaysia*, *16*(1), 193–204. https://doi.org/10.21837/pmjournal.v16.i5.423

Takahashi, M., Fukuda, H., & Arito, H. (1998). Brief naps during post-lunch rest: Effects on alertness, performance, and autonomic balance. *European Journal of Applied Physiology and Occupational Physiology*, *78*(2), 93–98. https://doi.org/10.1007/s004210050392

Thammapornpilas, J. (2015). Urban spatial development to mitigate urban heat island effect in the inner area of Bangkok. *Nakhara: Journal of Environmental Design and Planning*, *Vol. 11*, 29–40. https://doi.org/https://ph01.tci-thaijo.org/index.php/nakhara/article/view/104849

Tontisirin, N., & Anantsuksomsri, S. (2021). Measuring transit accessibility benefits and their implications on land value capture: A case study of the Bangkok Metropolitan Region. In *Annals of Regional Science* (Vol. 67, Issue 2). Springer Berlin Heidelberg. https://doi.org/10.1007/s00168-021-01053-2

Torres Chavarria, L. C., & Phakdee-auksorn, P. (2017). Understanding international tourists' attitudes towards street food in Phuket, Thailand. *Tourism Management Perspectives*, *21*, 66–73. https://doi.org/10.1016/j.tmp.2016.11.005

Trougakos, J. P., Beal, D. J., Green, S. G., & Weiss, H. M. (2008). Making the break count: An episodic examination of recovery activities, emotional experiences, and positive affective displays. *Academy of Management Journal*, *51*(1), 131–146. https://doi.org/10.5465/AMJ.2008.30764063

Trougakos, J. P., Hideg, I., Cheng, B. H., & Beal, D. J. (2014). Lunch breaks unpacked: The role of autonomy as a moderator of recovery during lunch. *Academy of Management Journal*, *57*(2), 405–421. https://doi.org/10.5465/amj.2011.1072

Untermann, R. K. (1984). *Accommodating the pedestrian: Adapting towns and neighborhoods for walking and bicycling* (June 1984). Van Nostrand Reinhold.

Villaveces, A., Nieto, L. A., Ortega, D., Ríos, J. F., Medina, J. J., Gutiérrez, M. I., & Rodríguez, D. (2012). Pedestrians' perceptions of walkability and safety in relation to the built environment in Cali, Colombia, 2009-10. *Injury Prevention*, *18*(5), 291–297. https://doi.org/10.1136/injuryprev-2011-040223

Yang, Y., & Diez-Roux, A. V. (2012). Walking distance by trip purpose and population subgroups. *American Journal of Preventive Medicine*, *43*(1), 11–19. https://doi.org/10.1016/j.amepre.2012.03.015