From Digital Traces to Healthy City Streets: Emotion-Behavior-Environment Links via City Jogging in Beijing

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Abstract

Urban streets are expected to support everyday health in high-density cities, yet evidence on what makes them jogging-friendly remains limited. City jogging combines exercise, socializing, and urban exploration, while smartphones and wearable devices record fine-grained runner-street interactions. Using Beijing as a case, this study links emotion, jogging behavior, and street environments to inform healthy street planning. We analyze approximately 67,000 Keep jogging trajectories within Beijing's Fifth Ring Road and 965 valid public online narratives from Xiaohongshu and Douyin. A contribution-based semantic network analysis, combined with affective cues, identifies four runner profiles: routine fitness, urban exploration, social running, and performance training. K-means clustering summarizes route forms, and street-level jogging intensity is modeled with built-environment and streetscape indicators using random forest regression and SHAP interpretation. The results show that emotion-related jogging produces distinct spatial preferences. Restorative runs are concentrated in parks and neighborhood loops, exploration-oriented runs gravitate to historic districts and landmark corridors, and training runs favor continuous routes such as ring roads. The environmental model further indicates that runnability is shaped by landmark attraction, service nodes, blue-green proximity, route structure, and visual openness. Building on these findings, the study proposes differentiated healthy street strategies, including neighborhood health loops, cultural exploration corridors, continuous training corridors, women- and novice-friendly access, and digital health feedback for adaptive street renewal.

Keywords: city jogging, healthy streets, online narratives, jogging trajectories, explainable machine learning

Introduction

Urban streets are increasingly becoming important spaces for everyday health in high-density cities. In many urban cores, formal sports venues cannot fully meet residents' demand for daily physical activity. Ordinary streets and connected public spaces therefore serve as informal fitness settings, especially for activities that do not depend on fixed facilities. Outdoor jogging is one such activity. It is low-cost, flexible, and easily embedded in daily routines, while also being highly dependent on the street environment itself. Runners need routes that are reachable and continuous, feel comfortable and safe, and provide destinations meaningful enough to sustain repeated use. Jogging-friendly streets therefore represent a broader planning question: how ordinary urban spaces can be reorganized to support health, mobility, and everyday urban experience (Giles-Corti et al., 2016; Liu et al., 2023; Sallis et al., 2016; Shi & Gao, 2024; Yang et al., 2024a; Zhong et al., 2024).

Existing research has significantly advanced the measurement of jogging behavior and street runnability. Crowd-sourced GPS trajectories and fitness-app records have been used to measure jogging volume, speed, route frequency, and route form at fine spatial scales (Gao et al., 2024; Huang et al., 2025; Liu et al., 2023; Yang et al., 2024a; Yang et al., 2024b; Yang et al., 2025). Such studies move jogging analysis beyond self-reported surveys and allow researchers to observe actual movement traces in cities. Meanwhile, street-level imagery and related geospatial datasets have expanded environmental measurement from macro-scale urban structure to human-scale perception (Liu et al., 2023; Shi & Gao, 2024; Yang et al., 2024a; Yang et al., 2024b). Recent studies have further shifted from linear correlation to nonlinear interpretation. Explainable machine-learning methods, especially random forest with SHAP or PDP, have been used to identify variable contributions, thresholds, effective ranges, and spatial heterogeneity (Liu et al., 2023; Shi & Gao, 2024; Tegart et al., 2025; Yang et al., 2024a; Yang et al., 2025). These studies have deepened our understanding of how physical street environments attract, constrain, or modulate jogging activity.

However, the experiential dimension of city jogging remains insufficiently connected with trajectory-based and environment-based analysis. A GPS track records movement, but not necessarily meaning. It can show where people run, what route forms they choose, and which environmental variables are associated with higher jogging intensity. Yet it says little about how runners describe these routes, what meanings they attach to them, and why some places are repeatedly selected. Text-based and social-media studies provide another entry point. Research on recommended jogging routes shows that joggers' environmental attention may differ from expert assumptions (Zhong et al., 2024). Studies on Citywalk and urban leisure activities also suggest that digital sharing, emotional experience, and physical space jointly shape the production and evaluation of urban activities (Chen et al., 2025). Research on runner preferences further highlights comfort, perceived safety, social atmosphere, and place attachment as important parts of running experience (Cook et al., 2016; Deelen et al., 2019; Ettema, 2016; Harden & Schuurman, 2025; Krenichyn, 2006; Schuurman et al., 2021; Shashank et al., 2022). Nevertheless, these strands of evidence are rarely connected with large-scale route-form analysis and street-level environmental modeling. Existing studies therefore tend to treat jogging either as a spatial flow to be predicted or as an experience to be interpreted, while the relationship among emotion, route behavior, and street environment remains underexplored.

This study examines emotion-behavior-environment links in city jogging in Beijing. Using the area within Beijing's Fifth Ring Road as the empirical setting, we combine public online

narratives from Xiaohongshu and Douyin, approximately 67,000 Keep jogging trajectories, and street-level built-environment indicators. A contribution-based semantic network is used to derive runner profiles from online narratives. K-means clustering is used to summarize route forms. Random forest regression with SHAP interpretation is used to examine the environmental determinants and nonlinear effects of street-level jogging intensity. Specifically, this study addresses three research questions:

RQ1: What emotional and behavioral profiles characterize city jogging in Beijing?
RQ2: How do jogging route forms and spatial preferences vary across the city?
RQ3: Which street-level environmental factors are associated with jogging intensity, and what do their nonlinear effects imply for healthy street renewal?

The contribution of this study is threefold. First, it brings affective and social meanings into runnability analysis through online narratives and contribution-based semantic network analysis. Second, it connects runner profiles with aggregate route forms and spatial preferences, showing how textual meanings and trajectory patterns can be interpreted together. Third, it uses RF–SHAP modeling to translate street-level environmental predictors into evidence for differentiated healthy street renewal in high-density urban cores.

Materials and Methods

Study Area

We focus on the area within Beijing's Fifth Ring Road, one of the most intensively developed parts of the city. Dense road networks, residential neighborhoods, commercial centers, public open spaces, historic urban areas, and blue-green corridors are closely interwoven within this area. The study area covers approximately 666.99 km² and contains 149,328 road segments, with a total road length of about 10,516.85 km and a road-network density of 15.77 km/km².

The area provides a representative setting for examining jogging in high-density urban cores. It includes ordinary neighborhood streets, major public spaces, transit-rich areas, commercial districts, and culturally recognizable routes within a continuous road network. These conditions make it possible to observe jogging activities across different street and open-space settings and to examine street-level links between urban form, public space, and everyday movement.

Figure 1

Study Area and Road Network Within Beijing's Fifth Ring Road

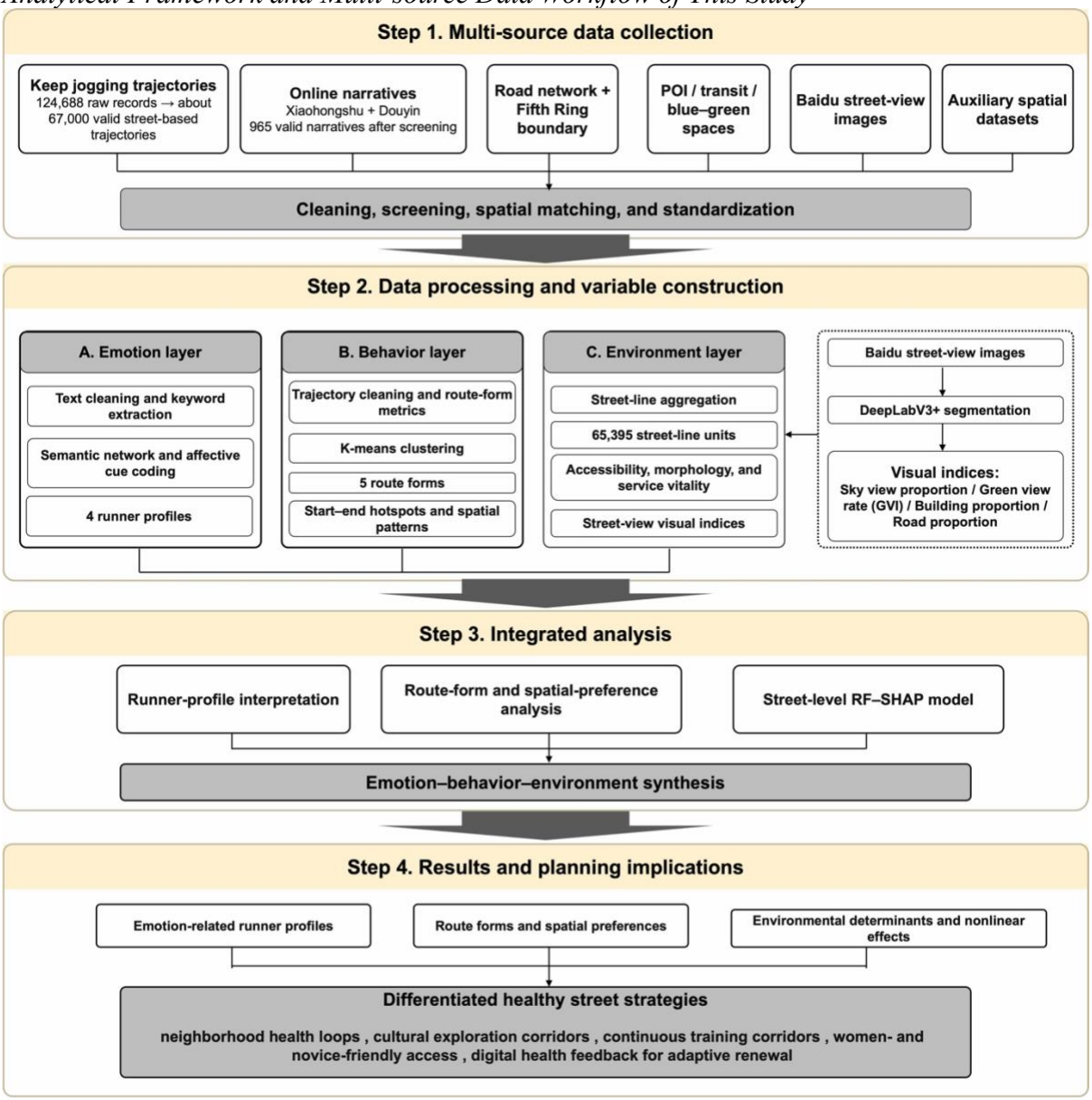
Data Sources and Preprocessing

This study combines three types of data: public online narratives, mobile-app jogging trajectories, and street-level built-environment indicators. Online narratives record how runners describe places, feelings, activity purposes, and social relations. Jogging trajectories show where running occurs and what route forms it takes. Street-level indicators describe the physical, visual, and functional conditions of the environments in which these movements take place.

The workflow included four stages. First, multi-source data were collected and screened. Second, the data were processed into narrative, trajectory, and street-environment layers. Third, runner profiles, route forms, and RF-SHAP model results were examined together to identify emotion-behavior-environment links. Finally, the results were used to support differentiated healthy street strategies. Data preprocessing included duplicate removal, manual screening, trajectory filtering, spatial clipping, road-network matching, street-line aggregation, and indicator standardization.

Figure 2

Analytical Framework and Multi-source Data Workflow of This Study



Online Narrative Analysis

Public online narratives were collected from Xiaohongshu and Douyin. Xiaohongshu posts are usually text-rich and often include route descriptions, place names, mood expressions, companions, and activity purposes. Douyin contributes image-text and short-video records, which add more visual and event-based forms of jogging sharing. Together, the two platforms provide materials for examining how city jogging is narrated and circulated online, in line with recent social-media studies of urban experience (Chen et al., 2025; Zhong et al., 2024).

The search terms included “Beijing city jogging,” “Beijing city slow jogging,” and “Beijing city running.” After duplicate removal, manual screening, and consistency checking, 621 Xiaohongshu texts and 344 Douyin texts were retained. The final sample contained 965 valid narratives and 199,744 Chinese characters.

The analysis proceeded in three steps. First, invalid, repeated, vague, non-Beijing, and non-jogging-related posts were removed. Second, word-frequency statistics and keyword extraction were used to identify high-contribution semantic terms. These terms were coded into four categories: place preference, emotional cue, activity purpose, and runner attribute. Third, co-occurrence links among the retained high-contribution terms were examined to construct a contribution-based semantic network. The network was interpreted by tracing repeated associations among place names, affective expressions, activity purposes, and runner attributes. On this basis, four interpretable runner-profile labels were derived and reported in the Results section.

Table 1

Public Online Narrative Data Collection and Screening

Platform	Processing Step	Count
Xiaohongshu	Initial retrieval	1669 notes
	After automatic duplicate removal	1285 notes
	After manual screening	621 valid texts
Douyin	Image-text records after ID-based duplicate removal	1199 records
	Video records after ID-based duplicate removal	136 videos
	After manual screening	344 valid texts
Combined corpus	Final online narrative sample	965 valid narratives
	Text volume	199,744 Chinese characters

Trajectory Processing and Route-Form Classification

Jogging trajectories were collected from the Keep platform. Keep was selected after comparing several sports and outdoor platforms because it provides a large volume of domestic jogging records and detailed trajectory information, including location, time, pace, and route traces. The raw records were screened by removing trajectories with abnormal speeds, missing time information, abnormal distances, or routes mainly located inside non-road spaces such as schools, squares, and enclosed parks. Similar filtering rules have been used in previous fitness-app trajectory studies to remove non-jogging and spatially noisy records (Liu et al., 2023; Yang et al., 2024a). After quality control and spatial screening, approximately 67,000 valid street-based jogging trajectories were retained.

Trajectory processing included line reconstruction, spatial clipping within the Fifth Ring Road, and aggregation to street-line units. To summarize route forms, four metrics were calculated for each trajectory: total route length, straight-line distance between start and end points, route complexity, and closure condition. K-means clustering was used for route-form classification (MacQueen, 1967). The elbow method was used to evaluate the number of clusters based on the within-cluster sum of squared errors (1):

$$SSE(k) = \Sigma_{j=1}^{k} \Sigma_{xi \in C_j} ||x_i - \mu_j||^2 \quad (1)$$

where k is the number of clusters, C_j is cluster j, x_i is a trajectory sample, and μ_j is the centroid of cluster j.

The elbow curve showed a clear reduction in marginal improvement around k = 4. Visual inspection, however, indicated that a small group of trajectories had a distinctive map-like geometry. This group was analytically meaningful and could not be well represented by the four-cluster solution. Therefore, k = 5 was adopted as a balance between statistical parsimony and spatial interpretability. The route-form counts reported later refer to trajectories with complete route-form metrics after geometric feature extraction. The final route-form categories are reported in the Results section.

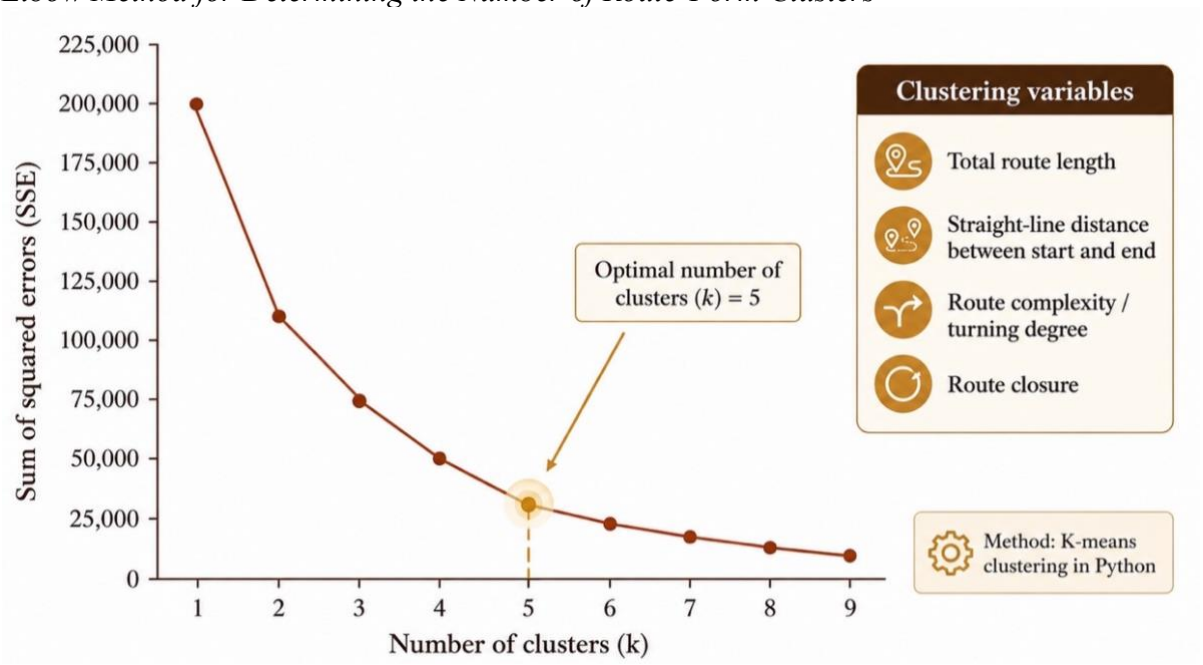
Table 2

Trajectory Filtering and Route-Form Variables

Stage	Item	Description
Trajectory screening	Speed and time filter	Records with an average speed below 5 km/h, above 25 km/h, or without valid time information were removed
	Distance filter	Records shorter than 400 m or longer than 50 km were removed
	Spatial filter	Routes mainly located inside schools, squares, enclosed parks, or other non-road spaces were removed
Trajectory processing	Route reconstruction	GPS point records were reconstructed into trajectory lines
	Street-line aggregation	Jogging trajectory intensity was aggregated to road-network line units
Route-form variables	Total route length	The total length of each reconstructed jogging trajectory
	Start–end distance	The Euclidean distance between the start and end points of each trajectory
	Route complexity	The degree of deviation from a simple straight or looped route
	Closure condition	Whether the start and end points of a trajectory were spatially close
Clustering	K-means and elbow method	K-means clustering was used for route-form classification, and the elbow method was used to evaluate the number of clusters

Figure 3

Elbow Method for Determining the Number of Route-Form Clusters



Built-Environment Indicators and Street-Level Modeling

To examine how street environments are associated with jogging intensity, trajectory intensity was aggregated to 65,395 street-line units and linked with built-environment indicators. The dependent variable was street-level jogging intensity, measured by the number of jogging trajectories associated with each road-network line unit. Because the variable was highly right-skewed, it was transformed before modeling (2):

$$Y_i = log(1 + Flow_i) \quad (2)$$

where Flow_i is the jogging trajectory volume of street-line unit i.

Environmental predictors were organized into five dimensions: streetscape visual environment, street morphology, blue-green space accessibility, transport accessibility, and service vitality. Streetscape visual indicators were extracted from Baidu street-view images using semantic segmentation. Following studies that used street-view imagery and deep learning to measure eye-level urban environments, a DeepLabV3+ model trained on the Cityscapes dataset was used to identify visual elements (Chen et al., 2018; Cordts et al., 2016; Liu et al., 2023; Yang et al., 2024a). Four visual indicators were calculated: sky view proportion, green view rate, building proportion, and road proportion. Other indicators were derived from road-network, POI, AOI, transit, social hotspot, and nighttime light datasets.

Random forest regression was used to model the relationship between jogging intensity and environmental predictors. Random forest does not assume a linear relationship between variables and is therefore suitable for identifying nonlinear, threshold, and saturation effects in built-environment-behavior relationships (Breiman, 2001; Liu et al., 2023; Yang et al., 2024a). Model performance was evaluated using a held-out test set. Ordinary least squares regression was used as a baseline comparison. SHAP values were then calculated to interpret the random forest model (Lundberg & Lee, 2017). Mean absolute SHAP values were used to rank predictor importance. SHAP dependence plots were used to examine the direction and possible nonlinearity of each environmental effect.

Table 3
Built-Environment Indicators for Street-Level Jogging Modeling

Dimension	Indicator
Streetscape visual environment	Sky view proportion
	Green view rate (GVI)
	Building proportion
	Road proportion
Street morphology	Average street ratio
	Junction density
	Walkability score
Blue–green space accessibility	Distance to park
	Distance to green space
	Distance to water bodies
Transport accessibility	Bus stop density
	Subway station density

Service vitality and social visibility	Tourism POI density
	Public service density
	Commercial density
	Residential density
	Social hotspot density
	Nighttime light intensity

Results

Emotional Cues and Runner Profiles

The online narratives formed a semantic field where emotion, purpose, and place were closely connected. High-contribution terms referred to streets, parks, the Forbidden City, hutongs, the Central Axis, companions, clubs, check-ins, and route plans. These words show how runners attached jogging to specific urban settings and everyday social situations.

After coding the terms into place preference, emotional cue, activity purpose, and runner attribute, four emotion-purpose patterns became clear. Restorative expressions, including healing, comfort, and relaxation, were linked to daily exercise and personal fitness. Pleasure, inspiration, and curiosity appeared with landmarks, hutongs, scenery, and exploratory routes. Happiness and belonging were associated with friends, clubs, and group running. Challenge, persistence, and goal orientation were connected to marathon training and longer-distance running.

The contribution-based semantic network further organized these patterns into four runner profiles. High-contribution links among place terms, affective cues, activity purposes, and runner attributes were used to identify routine fitness, urban exploration, social running, and performance training. These profiles represent recurring narrative patterns in public online accounts and show how runners describe their motivations, social relations, and preferred urban settings.

Figure 4

High-Contribution Semantic Terms in Online Jogging Narratives

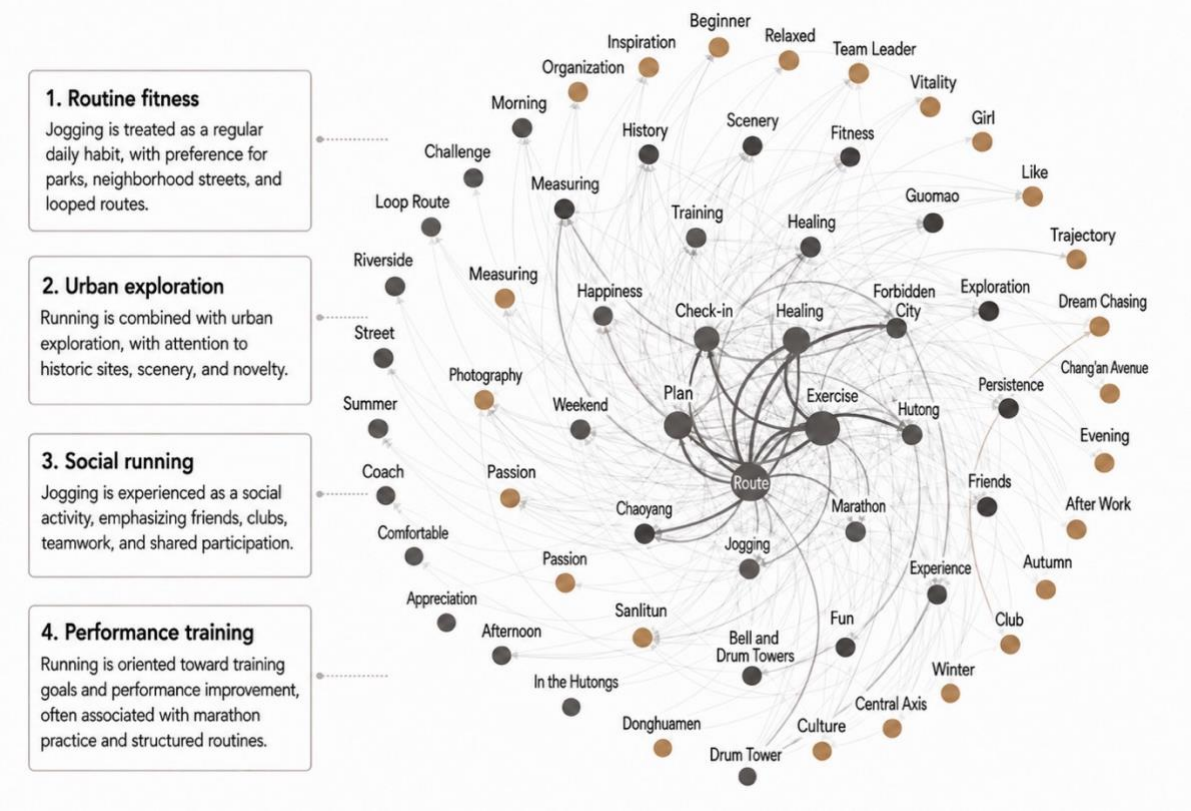
Table 4

Emotion–Behavior Coding From Online Narratives

Runner profile	Emotional cues	Behavioral purpose
Routine fitness	Healing; comfort; relaxation; daily rhythm	Daily exercise; personal fitness; habitual jogging
Urban exploration	Pleasure; inspiration; curiosity	City exploration; landmarks; scenery; route discovery
Social running	Happiness; belonging; companionship	Friends; clubs; group running; shared activities
Performance training	Challenge; persistence; goal orientation	Marathon training; distance running; performance improvement

Figure 5

Semantic Network and Runner-Profile Typology



Route Forms and Spatial Preferences

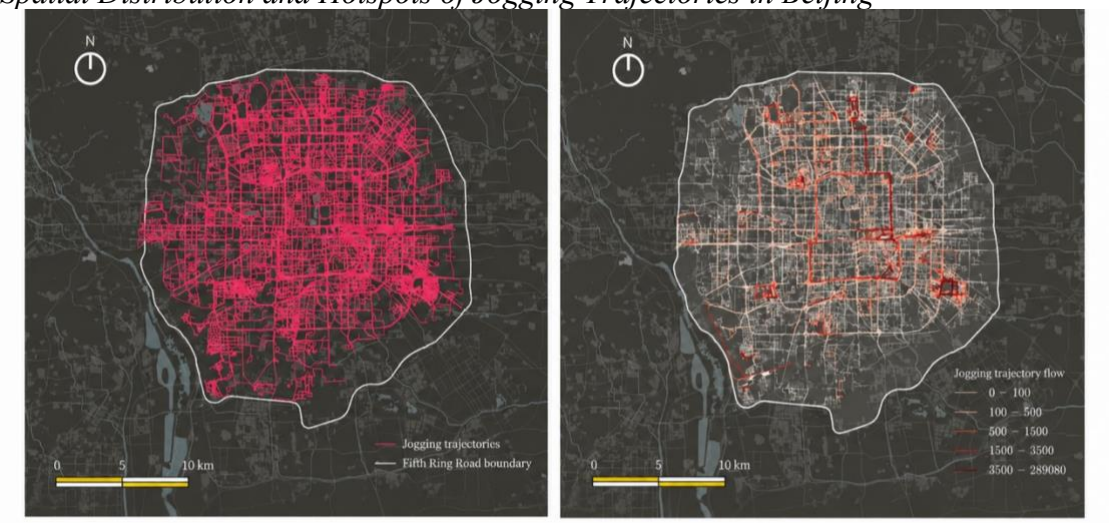
The trajectory data placed these narrative profiles into a spatial context. Jogging routes were distributed across the Fifth Ring Road area, with clear concentrations in the historic core, the Central Axis, ring-road corridors, large parks, the CBD, and selected waterfront spaces. These concentrations combined route continuity with recognizable urban settings.

Five route forms were identified through clustering. Short loops and short linear routes formed the main body of the sample and were mainly located near parks, riversides, residential neighborhoods, and everyday street spaces. Long linear routes and long loops were supported by ring roads and axial corridors. Map-like routes were rare, but their complex geometry and landmark-oriented locations made them analytically distinctive.

At the aggregate level, route forms align with the four narrative profiles. Routine fitness is most evident in short loops and short linear routes in familiar nearby settings. Urban exploration appears through map-like and landmark-oriented routes. Social running is more visible around service nodes, commercial areas, landmark corridors, and recognizable public places. Performance training is associated with long linear routes and long loops supported by continuous corridors.

Figure 6

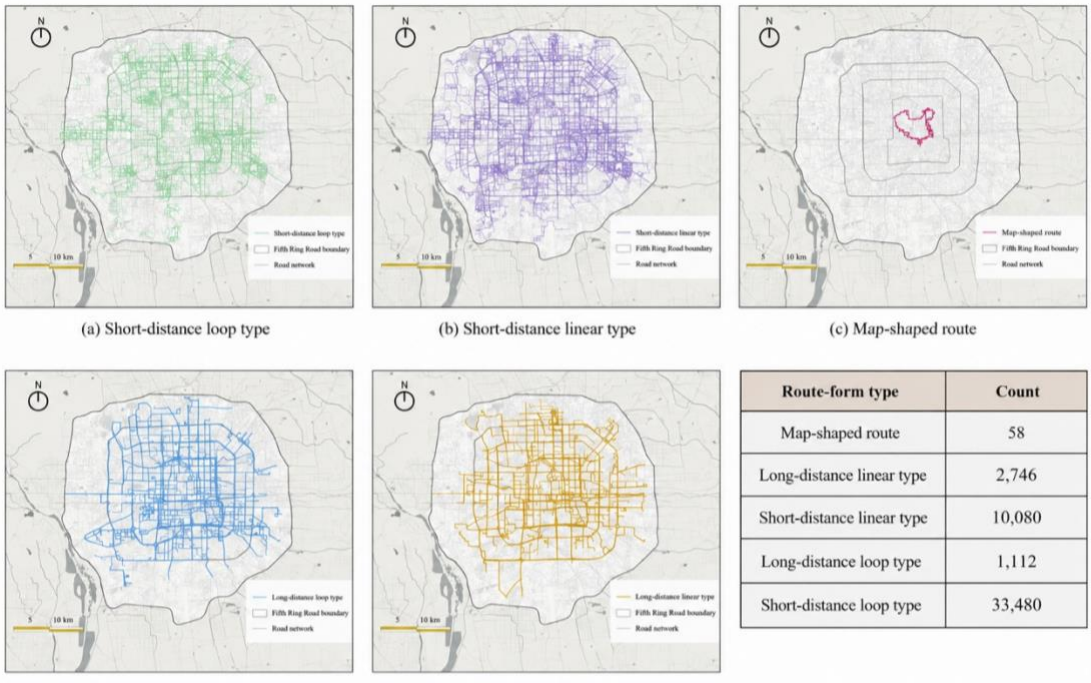
Spatial Distribution and Hotspots of Jogging Trajectories in Beijing



(a) Spatial distribution of jogging trajectories (b) Flow intensity of jogging trajectories

Figure 7

Five Route Forms and Their Spatial Patterns



(a) Short-distance loop type (b) Short-distance linear type (c) Map-shaped route

(d) Long-distance loop type (e) Long-distance linear type

Route-form type	Count
Map-shaped route	58
Long-distance linear type	2,746
Short-distance linear type	10,080
Long-distance loop type	1,112
Short-distance loop type	33,480

(f) Route-form types and counts

Table 5

Correspondence Between Runner Profiles, Route Forms, and Spatial Preferences

Runner profile	Route form(s)	Spatial preference
Routine fitness	Short-distance loops; short-distance linear routes	Parks; neighborhood streets; riversides; nearby open spaces
Urban exploration	Map-like routes	Hutongs; Central Axis; Forbidden City; Beihai; Chang'an Avenue
Social running	Short-distance linear routes; short-distance loops	Commercial areas; public service nodes; landmark corridors; group activity spaces
Performance training	Long-distance linear routes; long-distance loops	Ring roads; continuous corridors; axial routes

Environmental Profiles and Street-Level Determinants

After identifying route-form patterns and spatial preferences, we examined the street settings in which jogging activity becomes more intensive. Start–end hotspots were concentrated in multifunctional urban settings where transit access, parks or scenic areas, waterfront space, residential clusters, and commercial services overlap. These places act as anchors for jogging routes. They make routes easier to enter, create recognizable points for gathering or return, and help explain why certain routes are used repeatedly.

At the street-line scale, the random forest model performed substantially better than the linear baseline. The test-set R^2 reached 0.440, compared with 0.082 for ordinary least squares. This gap indicates that street-level jogging intensity was shaped by nonlinear environmental relationships. The SHAP ranking identified tourism POI density as the leading predictor, with a relative contribution of approximately 10.8%. Beyond this leading variable, high-ranked predictors clustered around three conditions: place visibility and street vitality, blue-green accessibility, and spatial openness. This pattern suggests that jogging intensity was shaped by the combined effects of landmarks, services, accessible open spaces, and street form.

The dependence plots further clarified the direction and effective range of these effects. Tourism POI density showed a rapid positive effect at low-to-moderate levels, with the marginal gain beginning to level off after approximately 60–80 POIs. Public service density contributed little when fewer than about 15–20 facilities were present, but became more supportive beyond this range. Blue–green accessibility showed a distance-decay pattern: streets within roughly 80–100 m of green spaces or water bodies were more favorable for jogging, while longer distances weakened this effect. Road proportion was most supportive around 0.11–0.14; lower values indicated insufficient route space, whereas higher values added limited benefit. Sky view proportion became more favorable after approximately 0.45–0.50, while building proportion turned negative after about 0.12–0.15, suggesting that openness supports jogging more than excessive enclosure. Commercial density worked best at a moderate level, around 30–50 POIs. Lower values provided limited service support, while higher values may introduce crowding and route interruption.

Figure 8

Start–End Points and Facility Contexts of Jogging Routes

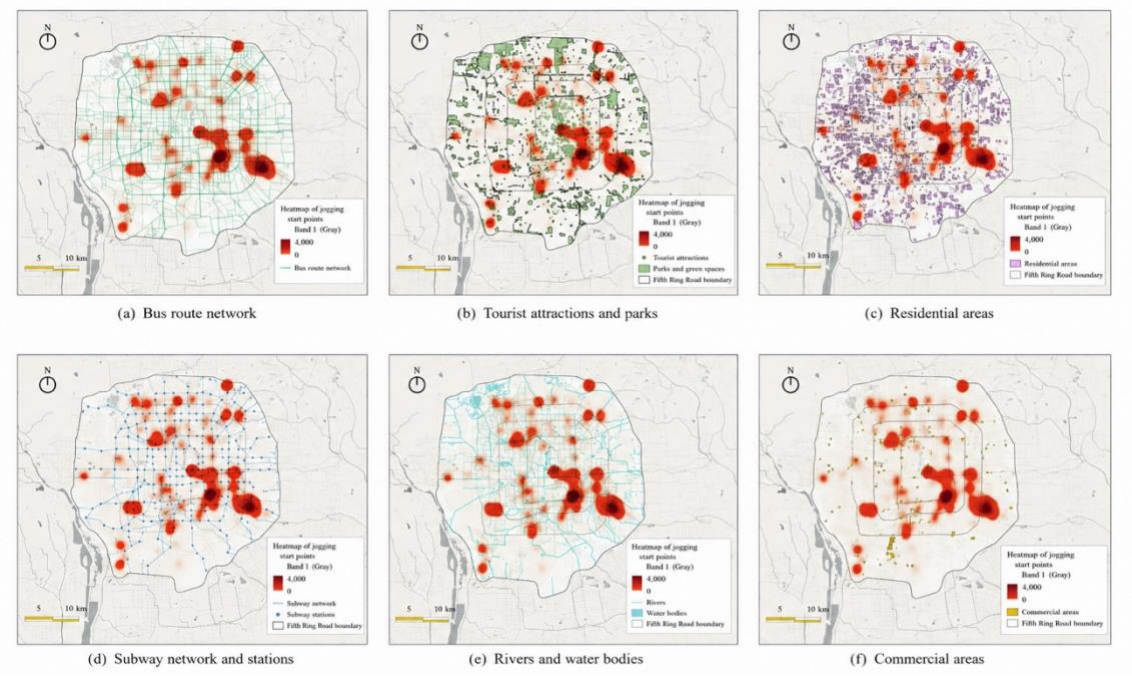


Figure 9

Relative Importance of Environmental Predictors Based on SHAP Values

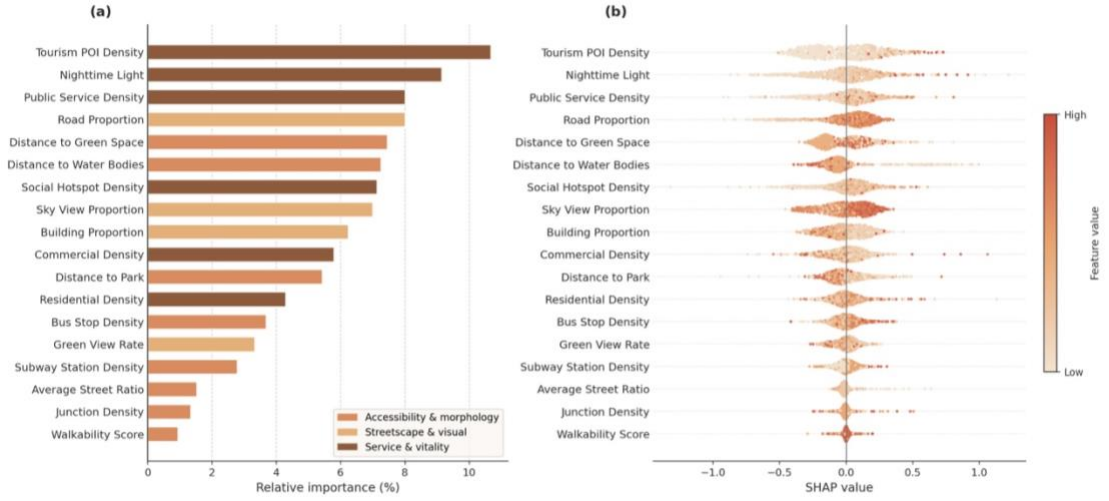
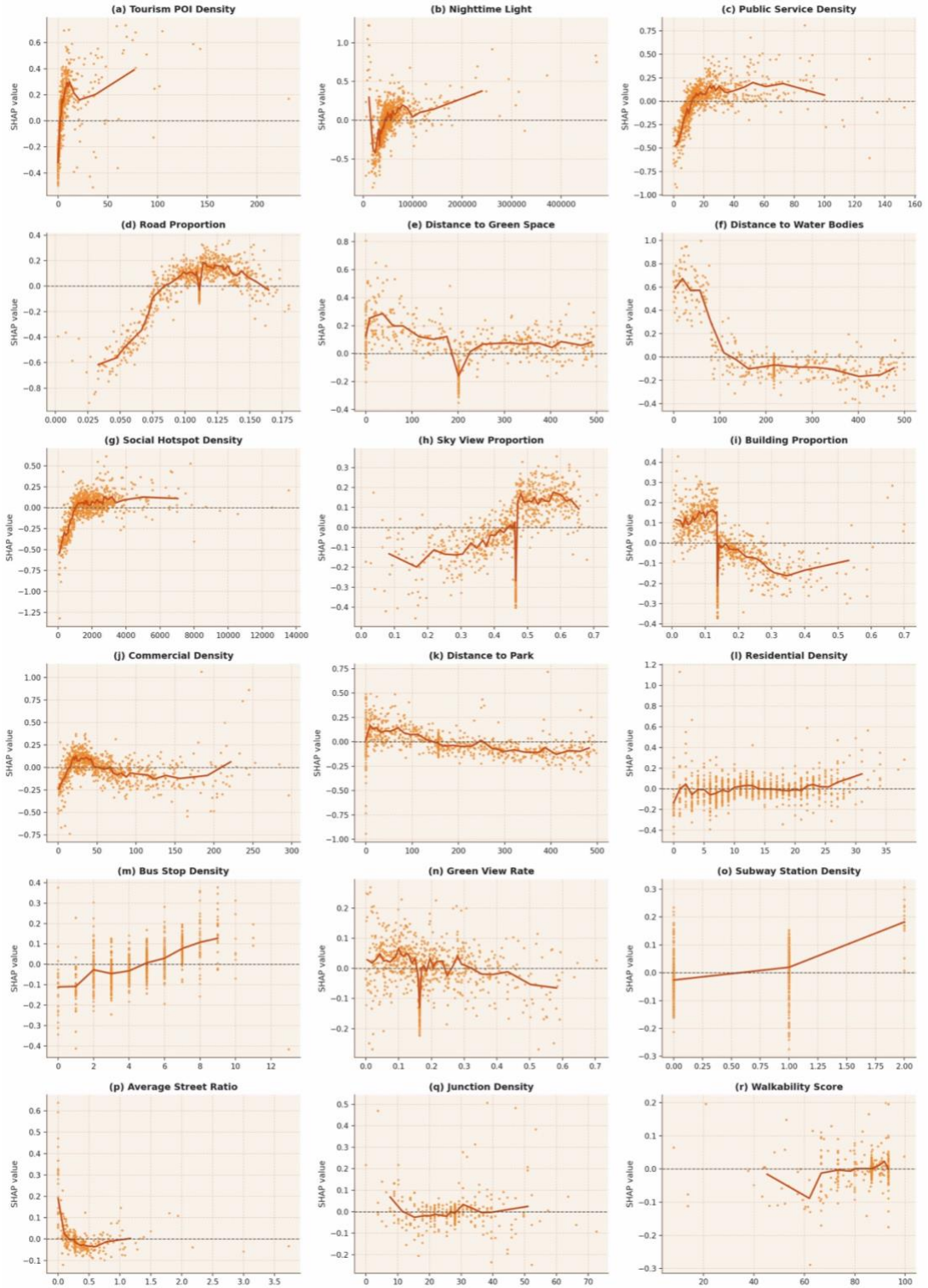


Figure 10

SHAP Dependence Plots of Selected Environmental Variables



Discussion

Emotion-Behavior-Environment Links in City Jogging

Taken together, the narrative, trajectory, and street-level modeling results show that city jogging in Beijing is organized through three connected dimensions: what runners feel and seek, how they translate these expectations into route choices, and which street conditions allow these choices to persist. Online narratives reveal affective and social meanings. Trajectory clustering shows their spatial expression. The RF–SHAP model identifies the environmental conditions that support repeated use. Table 6 summarizes this synthesis.

Routine fitness is grounded in repeated use. Runners describe this type of jogging through recovery, comfort, and daily rhythm. Its route form is correspondingly modest: short and familiar routes around parks, riversides, and residential streets. These places reduce the effort required to start jogging and allow the activity to become part of everyday life. The negative effect of park distance reinforces this interpretation, suggesting that nearby open space remains central to restorative and routine jogging.

Urban exploration gives jogging a stronger place-based meaning. References to hutongs, the Central Axis, and other historic streets indicate that some runners use jogging to encounter Beijing as a cultural landscape. Map-like and landmark-oriented routes concentrate around the historic core, where cultural recognition and route novelty reinforce each other. Tourism-related nodes and social hotspots also contribute to this pattern, indicating that some streets become attractive running scenes because they are recognizable, shareable, and culturally specific.

Social running is organized around shared access to the activity. Terms related to companions, clubs, beginners, and coaches show that group confidence is part of this profile. Its routes are often anchored by clear start–end settings near parks, transit-accessible streets, and service-rich areas. These settings support meeting, waiting, joining, and returning within ordinary urban routines.

Training-oriented jogging is structured by continuity. Long linear and loop routes along ring roads and major corridors correspond to goals of pacing, endurance, and route recording. Road structure, sky view, and building enclosure help explain this pattern because they shape whether a street can sustain a stable running rhythm.

Overall, the four runner profiles show that runnability varies by jogging scene. Routine routes depend on proximity and low entry cost. Exploratory and social routes depend on recognizable urban scenes, service nodes, and shared start–end settings. Training routes depend on continuity, openness, and lower interruption. This synthesis provides the basis for the differentiated street strategies discussed below.

Table 6

Emotion-Behavior-Environment Synthesis of City Jogging in Beijing

Runner profile	Emotional perception	Route choice and preference	Environmental support
Routine fitness	Recovery and everyday rhythm.	Short repeatable routes near parks, riversides, and residential streets.	Nearby open space and local services that lower the threshold for frequent use.
Urban exploration	Cultural curiosity and place experience.	Map-like or complex routes around hutongs, the Central Axis, the Forbidden City–Beihai area, and Chang'an Avenue.	Legible landmarks and social hotspots that make routes recognizable and shareable.
Social running	Companionship and group confidence.	Routes anchored by clear start–end settings near parks, transit, and service-rich streets.	Accessible gathering points that support meeting, waiting, and return.
Training-oriented	Challenge and performance goals.	Long routes along ring roads and major urban corridors.	Continuous and open corridors that support pacing and endurance.

From Runnability to Differentiated Healthy Street Strategies

The synthesis above can help translate runnability analysis into planning priorities. Different jogging scenes reveal different needs: routine fitness depends on nearby open spaces and low entry costs; exploratory and social jogging rely on recognizable urban scenes, service nodes, and safe start–end settings; training-oriented jogging requires continuous and less interrupted corridors. These differences suggest a differentiated approach to renewal, with each route context receiving the type of support it most clearly lacks.

First, women- and novice-friendly access deserves clearer attention in neighborhood jogging updates. The narrative terms referring to girls, beginners, companions, clubs, and coaches indicate that some runners experience jogging through safety, accompaniment, and entry support. For neighborhood loops near parks, residential areas, and transit stops, the key locations are the route entrance, the crossing, and the return point. These spaces shape whether a route feels easy to find, safe to enter, and comfortable to complete. Better evening lighting, clearer sightlines, safer crossings, and small service points near route starts can lower the practical barrier to participation. Such improvements are especially relevant for women and new runners, while also benefiting older users and group running.

Second, renewal priorities can be organized by jogging scene. Routine fitness requires neighborhood health loops. The concentration of short routes near parks and the negative effect of park distance suggest that daily jogging depends on open space that is close enough to be used repeatedly. Low-conflict jogging paths can connect park entrances, waterfront edges, and nearby residential streets, turning existing blue–green spaces into everyday health infrastructure. Exploratory and social jogging require cultural routes. The concentration of narratives and trajectories around hutongs and the Central Axis indicates that some historic streets already function as recognizable running scenes. Renewal in these areas can strengthen route guidance, evening usability, and crossing safety, while adding small pause points with minimal disturbance to heritage settings. Training-oriented jogging depends on continuity. Along ring roads and major corridors, safer junctions, shaded running lines, open sightlines, and periodic supply points can support pacing and endurance. Greenery contributes to runnability when it strengthens a continuous route and connects to usable public space.

Third, runner-generated platform records can support adaptive street renewal. Keep trajectories identify where jogging has become part of daily street life, while online narratives reveal how these routes are felt, remembered, and shared. Their combination can help planners distinguish different renewal priorities. Routes with high use and positive narratives can be treated as existing health assets. Busy routes with weak public response may require field checks for lighting, congestion, crossing safety, or missing services. Routes with strong online visibility but limited trajectory use may indicate that cultural appeal has not yet been matched by sufficient spatial support. In this way, platform records can become a feedback layer for healthy street renewal, helping public investment respond more closely to observed use and lived experience.

Applicability and Limitations

The applicability of this study lies in two aspects. First, it proposes an emotion–behavior–environment framework for interpreting city jogging. This framework connects how runners describe places, how jogging routes are formed, and which street-level conditions support repeated use. Other dense cities may not share Beijing's hutongs, Central Axis, or ring-road structure, but they often contain similar jogging practices: routine exercise near neighborhoods, exploratory running around recognizable places, social running supported by shared start–end settings, and training-oriented running along continuous corridors. The framework can therefore help other cities interpret their own jogging spaces through local narratives, trajectory records, and street-level indicators.

Second, this study shows how runner-generated platform records can become a form of digital health feedback. Online narratives and app trajectories are not only research data; they can also help planners observe emerging health routines, identify routes with unmet demand, and adjust renewal priorities over time. This approach is especially relevant for cities seeking to connect digital health practices with street-level urban renewal.

The study also has limitations. The empirical analysis focuses on Beijing's inner-city area, where historical streets, ring roads, large parks, and platform use patterns shape the observed results. The findings should therefore be interpreted with attention to local urban form and data context. Platform records also tend to represent runners who are willing to record, post, or share their experiences, so the results are better understood as patterns among digitally visible runners. Finally, RF–SHAP reveals associations and nonlinear patterns; future research can further test planning effects through field audits, interviews, and before–after evaluations of street interventions.

Conclusion

This study examined how emotion, route behavior, and street environment are connected in Beijing's city jogging practices. By combining public online narratives, keep trajectories, and street-level environmental indicators, it showed how runners' affective perceptions are expressed through route choices and how these choices are supported by local street conditions.

Three findings are central. First, online narratives distinguish four recurring runner profiles: routine fitness, urban exploration, social running, and performance training. These profiles reflect different relations between jogging and the city, from everyday recovery to cultural discovery and endurance-oriented practice. Second, these meanings are visible in route forms. Short familiar routes support daily fitness, map-like routes cluster around culturally

recognizable areas, and long linear or loop routes follow corridors that sustain training. Third, the RF–SHAP results indicate that street runnability emerges from the combined effects of several environmental conditions. Landmark attraction, service vitality, park proximity, route structure, visual openness, and development intensity jointly shape whether jogging can persist on a street.

The study contributes to runnability research by linking online affective narratives, trajectory behavior, and street-level environmental modeling. It also shows that city jogging should be understood as both a physical activity and a social urban practice. For planning, the findings suggest that healthy street renewal should consider differentiated jogging scenes rather than rely only on standardized running lanes. Beijing needs neighborhood health loops for daily exercise, cultural routes for exploration and social connection, and continuous corridors for training. Women- and novice-friendly access should be embedded in ordinary jogging infrastructure, while runner-generated platform records can inform digital health feedback and adaptive renewal.

Future research should validate these findings through field audits, interviews, and before–after studies of street interventions. Comparative studies across cities would further test how the proposed emotion–behavior–environment framework can be adapted to different urban contexts.

Declaration of Generative AI and AI-Assisted Technologies in the Writing Process

The authors declare that ChatGPT by OpenAI was used to assist with English grammar checking, language polishing, and reference-format checking. The use was limited to proofreading, improving clarity, and checking formatting consistency. All AI-assisted suggestions were reviewed and edited by the authors. The ideas, research design, data processing, analyses, findings, and discussion were originally developed by the authors, who take full responsibility for the content of the manuscript.

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