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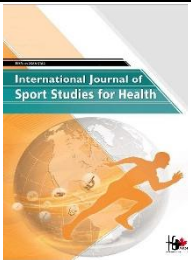

Quantitative Risk Assessment of Outdoor Fitness Equipment Safety in Rainy Conditions Using the L-Type Matrix Method

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A B S T R A C T

Objective: To address a critical gap in proactive risk management for public recreational infrastructure, this study quantitatively assesses the safety risks posed by rainy weather on outdoor fitness equipment using the L-type matrix method.

Methods: A mixed-method approach, which combines quantitative and qualitative data, was employed. A total of 240 participants from two similar outdoor fitness parks evaluated the usability of eight different equipment pieces (B1-B8) on a 0-2 scale (0=Unusable, 1=Cautious Use, 2=Usable) under wet conditions. Quantitative data were analyzed using descriptive statistics, the L-Type Matrix Risk Analysis—where probability (O) was calculated as O = 2 - Usability Score to accurately reflect accident likelihood—and one/two-way analysis of variance tests. Qualitative data from the focus group interviews were analyzed through content analysis.

Findings: The L-Type Matrix analysis revealed that seven out of the eight equipment pieces posed a "high risk," and one (B2 - Elliptical Bike) posed a "very high risk." The elliptical bike (B2) had the lowest usability score (0.23), correlating with the highest accident probability. No significant differences were found based on gender or age ($p > 0.05$), confirming that environmental factors are the primary risk determinants, not user demographics. Qualitative findings strongly supported these results, with 81% of participants reporting significant safety concerns regarding surface slipperiness and 68% highlighting water accumulation and corrosion issues.

Conclusion: This study provides quantitative evidence that rainy conditions create serious safety hazards in outdoor fitness areas. The findings underscore the necessity of integrating environmental safety parameters—such as non-slip and permeable surfaces, effective drainage, corrosion-resistant materials, and clear warning systems—as a core component of the design, planning, and maintenance of public exercise infrastructure. The application of the L-type matrix method demonstrates its utility as a practical tool for proactive risk assessment in this context.

Keywords: *Outdoor Fitness Equipment, Slip and Fall Risk, L-Type Matrix, Risk Assessment, Public Space Safety, Rainy Weather*

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1. Introduction

Sedentary behaviors have become a defining feature of modern urban life, creating a public health crisis where physical inactivity now ranks as the fourth leading cause of death globally. This silent pandemic, which is responsible for an estimated 3.2 million deaths annually, reveals a fundamental mismatch between contemporary lifestyles and basic human health requirements (1, 2). In confronting this challenge, the World Health Organization's (2020) recommendation of 150 minutes of moderate-intensity weekly exercise for adults serves as a crucial guideline for action (3). Outdoor exercise areas and fitness parks have become more than just recreational facilities; they now function as an essential community health infrastructure. They stand at the crossroads of preventive medicine and equitable urban design by providing free, accessible, and socially engaging spaces for physical activity, thereby promoting public health (4, 5).

The importance of these spaces extends well beyond exercise-induced physiological gains. A substantial body of research has established that physical activity in natural environments delivers deep-rooted psychological and social advantages. These include enhanced cognitive function, significant reductions in psychological stress, and stronger social ties within communities (6, 7). The impact of these spaces can be profound; long-term use is associated with notable improvements in cardiorespiratory fitness, self-esteem, and overall quality of life (8). As a result, how we view outdoor exercise has changed significantly; it is now commonly understood as a "therapeutic environmental interaction," a key strand in the weave of sustainable and health-promoting city planning (9).

However, this positive health promotion story is threatened by a frequently ignored environmental risk. The defining outdoor character of these spaces simultaneously makes them susceptible to weather, establishing a pivotal relationship between user safety and the elements (10, 11). Rainy weather is a major concern that fundamentally changes the safety profile of outdoor fitness equipment. Rain creates a series of physical dangers: it severely reduces friction on walking surfaces and handholds, decreases slip resistance on metal parts, and accelerates corrosion. This not only limits how the equipment can be used but also greatly increases the short-term risk of injury (12, 13). The connection seen in public health data is clear; multiple studies have measured a direct link between rainfall and a higher rate of slip-and-fall accidents, identifying water pooling after rain as a key factor (14).

The real-world impact of these environmental safety failures is serious and works against public health objectives. Large-scale studies, including Kim's (15) research, show that environmental hazards cause more outdoor falls than indoor ones, with sports and leisure activities being a typical setting for these accidents. This situation creates a difficult dilemma: in certain conditions, the infrastructure built to improve health can become a cause of injury. This core problem risks canceling out the intended benefits of these spaces, reinforcing the basic principle that without guaranteeing user safety, the gains from physical activity are unattainable (16).

Adding to this physical danger is a corresponding shortfall in forward-thinking regulation and design strategy. Although studies, such as those by Sun et al. (17), verify that ground structure, equipment layout, and safety barriers are basic components of safety—especially for vulnerable groups—the rules governing public infrastructure often lag behind, only responding after problems arise. Widgets and Middelberg (18) noted that safety measures are often implemented reactively rather than being built into the design and planning stages. This gap in regulation is especially worrying because environmental effects on these spaces, such as changing drainage efficiency with the seasons, are variable factors that affect both immediate user safety and the infrastructure's long-term durability (19).

Therefore, a significant divide persists between knowing that rain-related hazards exist and having the organized, numerical data needed to properly handle them. While the existing literature contains many general recognitions of these risks (11, 12, 14), a unified model that can measure the specific dangers rainy weather creates for various outdoor fitness equipment is lacking (18, 20). This knowledge gap hinders the creation of a fact-based foundation for preemptive safety management, depriving designers, urban planners, and public health officials of the specific tools required to prioritize risks and implement focused solutions.

This study aims to bridge this exact divide. The L-Type Matrix method (21, 22), a well-established risk assessment technique from industrial engineering and occupational safety, was used to convert general awareness into usable evidence. Its structured approach, which integrates probability and severity parameters to produce quantitative risk categories, is particularly appropriate for our goals. The method's relevance to public sports facilities is supported by practice; its previous use in evaluating safety ergonomics, as shown by Uca and Alizadehebadi (23) in a boxing context, offers a solid foundation for its application here.

Motivated by this methodological potential, this study aims to quantitatively measure, classify, and prioritize the safety risks that rainy weather conditions pose to outdoor fitness equipment. The following specific questions are used to answer this overall aim:

1. What specific mechanical and ergonomic safety risks do rainy weather pose to different types of outdoor fitness equipment?
2. What are the quantitative risk scores of these risks based on the "probability" and "severity" parameters of the L-Type Matrix and the corresponding risk level classification?

What evidence-based, proactive preventive measures can be developed for the resulting risk scenarios in the context of equipment design, maintenance protocols, and user warning systems?

2. Methods and Materials

2.1 Research Model and Participants

A mixed-method approach was adopted to investigate the safety and usability of outdoor fitness equipment during rainy weather. Purposive sampling was used to recruit 240 voluntary participants (120 from Park A and 120 from Park B) to achieve a balanced mix of gender, age, and education-based user profiles. The participant group consisted of 51.7% female and 48.3% male users, spanning age groups from 15-24 (32.5%), 25-39 (39.2%), to 40-60 (28.3%). Schneider et al. (20) supported this user-centered methodological choice, whose model for preventing climate-related health risks in outdoor sports emphasizes the need to understand user interactions and perceptions within their environmental context.

2.2 Data Collection Process

For the quantitative part of the study, the participants were asked to rate the usability of eight different outdoor fitness equipment pieces (B1–B8) on a simple scale from 0 to 2, where 0 meant "Unusable," 1 indicated "Cautious Use," and 2 represented "Usable," based specifically on their experiences in rainy conditions. To gather richer, qualitative insights, semi-structured focus group interviews were conducted, with groups of 6-8 people and sessions lasting 60-90 minutes each. The discussion guide for these interviews covered key themes such as surface safety, equipment design, drainage problems, slip risk, and available user information. Using multiple data sources in this manner is a well-regarded strategy for building a robust understanding of risk. This approach is consistent with the findings on industrial safety. For example, Rivera Domínguez et al. (24) showed that combining different types of data leads to a more complete framework for identifying hazards and estimating risks.

2.3 L-Type Matrix Method

The risk analysis was conducted using the L-type matrix method, a systematic technique with strong foundations in industrial engineering and occupational safety (21, 22). The final risk level (R) is calculated using the formula $R = O \times S$, where O represents probability and S represents severity. The value of applying such structured risk assessment tools is recognized in various fields. Zhang and Mohandes (25), for instance, effectively created a comprehensive, Z-numbers-based risk management framework for green building projects, underscoring the importance of structured methodologies for proactive safety management in complex situations (25).

A key adjustment was introduced in the method's application. The probability (O) parameter was defined as the likelihood of an accident and was calculated using the formula O = 2-Usability core. This step was essential because a low usability score corresponds to a high probability of something going wrong. Using the usability score directly would have yielded confusing and counter-intuitive risk values. For the severity (S) coefficient, we assigned a value from 1 to 3 (where 1 is low severity and 3 is high severity) based on expert evaluation, which considered technical aspects such as the number of moving parts, the proportion of metal surface, corrosion risk, and potential for water to accumulate.

2.4 Data Analysis

The collected data were analyzed using descriptive and inferential statistics. The descriptive analysis included calculating means ($\bar{x}$), standard deviations (SS), frequencies (f), and percentages (%). One-way analysis of variance (ANOVA) was used for inferential analysis to check for differences between groups based on gender, age, and education, and two-way ANOVA was used to examine any interaction between park location and gender. We set our significance level at $p < 0.05$ with a 95% confidence interval. To understand the magnitude of any observed effects, the eta-squared (η^2) coefficient was calculated for each test. Finally, the average usability scores (which indicated probability) were multiplied by the structural severity coefficients in the risk analysis stage to arrive at the final risk scores (R).

2.5 *Validity and Reliability*

To ensure the consistency of the data collection tool, its internal reliability was measured using Cronbach's alpha coefficient, which returned a high value of $\alpha = 0.91$. Two researchers independently coded the interview transcripts for the qualitative analysis, achieving a strong level of agreement between them ($\kappa = 0.87$). Furthermore, the validity of the findings was strengthened through data triangulation by systematically comparing field observations, participants' opinions, and photographic evidence. This process ensured the consistency of the qualitative and quantitative data.

3. Results

This section presents the results of the analyses conducted to quantitatively measure the specific safety risks that rainy weather poses to outdoor fitness equipment. In line with the research questions outlined in the Introduction, the findings are presented under four main headings: (1) equipment usability levels, (2) quantitative risk scores and risk level classification calculated via the L-Type Matrix method, (3) risk scenarios supported by qualitative data, and (4) statistical comparisons based on demographic variables.

3.1 *Participant Characteristics*

As detailed in Table 1, the research sample comprised 240 participants who regularly use outdoor fitness equipment, with equal representation from two distinct park locations that shared similar infrastructure characteristics. The gender distribution was nearly balanced, with 124 (51.7%) female and 116 (48.3%) male participants. The largest user group was adults aged 25-39 years (n=94, 39.2%), followed by young adults aged 15-24 years (n=78, 32.5%) and middle-aged users 40-60 years (n = 68, 28.3%). The educational background assessment showed that 114 participants (47.5%) held university degrees, 79 participants (32.9%) were high school graduates, and 47 participants (19.6%) had postgraduate qualifications. Statistical comparison using chi-square tests confirmed that the distribution of participants across both parks was demographically equivalent in terms of gender (χ^2=0.27, p=0.60), age groups (χ^2=0.52, p=0.77), and education levels (χ^2=0.18, p=0.91), ensuring a valid comparative analysis between locations.

Table 1. Demographic Characteristics of Participants (n = 240)

Variable	Category	Park A (n)	Park B (n)	Total (n)	%
Gender	Female	64	60	124	51.7
	Male	56	60	116	48.3
Age Group	15–24	38	40	78	32.5
	25–39	46	48	94	39.2
	40–60	36	32	68	28.3
Education Level	High School	38	41	79	32.9
	University	58	56	114	47.5
	Postgraduate	24	23	47	19.6

Note: The maintenance frequency (every 6 months) and usage periods (3-4 years) of the equipment in both parks are similar. The field observations revealed similar mechanical conditions (surface wear and corrosion) of the equipment in both parks.

3.2 *Equipment Usability Levels*

The usability assessment during rainy conditions revealed consistent critical scores across all eight types of equipment (Table 2). The Elliptical Bike (B2) demonstrated the most severe usability restrictions, with a mean score of 0.23 (±0.52), indicating near-complete dysfunctionality during wet conditions. In contrast, the Body and Leg Developer (B1) and Arm Cycle (B7) scores were relatively higher but still inadequate at 0.50 (±0.62 and ±0.61 respectively). Intermediate usability values were observed for the Triple Weight Station (B3: 0.42±0.59), Space Walker (B8: 0.45±0.60), Dual Pendulum Swing (B5: 0.39±0.60), Step and Waist Twister (B4: 0.36±0.54), and Air Walker (B6: 0.36±0.57). The remarkable consistency of low scores across both parks (Park A and Park B showed minimal variation) strongly suggests that rainfall impacts equipment functionality universally, transcending specific park designs or maintenance routines.

Table 2. Usability Values of Outdoor Fitness Equipment (Mean ± SD)

Equipment	Park A	Park B	Total Mean
B2 – Body and Leg Developer	0.52 ± 0.63	0.49 ± 0.61	0.50
B2 – Elliptical Bike	0.25 ± 0.54	0.21 ± 0.50	0.23
B3 – Triple Weight Station	0.43 ± 0.59	0.41 ± 0.58	0.42
B4 – Step and Waist Twister	0.38 ± 0.56	0.33 ± 0.52	0.36
B5 – Dual Pendulum Swing	0.40 ± 0.61	0.39 ± 0.59	0.39
B6 – Air Walker	0.37 ± 0.55	0.36 ± 0.58	0.36
B7 – Arm Cycle	0.51 ± 0.62	0.49 ± 0.61	0.50
B8 – Space Walker	0.46 ± 0.59	0.43 ± 0.60	0.45

According to Table 2, the mean usability values range from 0.23 (B2 – Elliptical Bike) to 0.50 (B1 and B7), remaining below the "Cautious Use" level for all equipment. This indicates that rainfall creates common risks such as slippery surfaces, grip loss, and reduced stability for all types of equipment.

3.3 L-Type Matrix Risk Analysis Results

The transformation of usability scores into risk metrics through the L-Type Matrix produced compelling evidence of safety hazards, with complete results shown in Table 3. The risk classification system, specifically calibrated for this study, categorized scores as follows: Low (1.00-2.00), Medium (2.01-3.50), High (3.51-5.00), and very high (5.01+). The Elliptical Bike (B2) emerged as exceptionally hazardous with a risk score of 5.31, driven by its extremely low usability (0.23) and high severity coefficient (3) due to its unstable design and multiple moving parts. The remaining seven pieces of equipment all fell into the high-risk category, with scores ranging from 3.00 to 3.28. This narrow range indicates that while the elliptical bike presents exceptional danger, all outdoor fitness equipment undergoes substantial risk elevation during rainy conditions, with risk scores typically increasing by 150-200% compared to dry conditions.

Table 3. Type Matrix Risk Analysis Results (Corrected)

Equipment	Usability	Probability (O)	Severity (S)	Risk Score (R = O×S)	Risk Level
B1 – Body and Leg Developer	0.50	1.50	2	3.00	High
B2 – Elliptical Bike	0.23	1.77	3	5.31	Very High
B3 – Triple Weight Station	0.42	1.58	2	3.16	High
B4 – Step and Waist Twister	0.36	1.64	2	3.28	High
B5 – Dual Pendulum Swing	0.39	1.61	2	3.22	High
B6 – Air Walker	0.36	1.64	2	3.28	High
B7 – Arm Cycle	0.50	1.50	2	3.00	High
B8 – Space Walker	0.45	1.55	2	3.10	High

Note: Risk classification is based on the updated score ranges: 1.00-2.00 (Low), 2.01-3.50 (Medium), 3.51-5.00 (High), and 5.01+ (Very High).

3.4 Qualitative Findings

Thematic analysis of focus group discussions provided rich contextual understanding of the quantitative findings. The participants consistently described the three interconnected risk domains as follows:

The most frequently reported concerns were surface slipperiness and ground safety, with 81% of participants describing incidents or near-misses due to compromised traction. Metal surfaces were particularly problematic, with users reporting that "handrails become dangerously slick within minutes of rainfall onset" and that "pooling water creates invisible ice-rink conditions on supposedly non-slip surfaces."

Equipment design and water accumulation issues were reported by 68% of participants, who highlighted specific design flaws that intensified weather-related risks. The critical points included water collection in seat contours, inadequate drainage in moving joints, and the tendency of certain materials to retain moisture long after rainfall cessation. One participant noted that "water sits in the bucket seats of the leg developer, creating both immediate slip hazards and long-term corrosion problems."

User Information Deficit was identified by 74% of participants as a systemic failure in risk management. Users expressed frustration at the complete absence of weather-related warnings, with many suggesting that "simple signage indicating increased fall risk during wet conditions could prevent numerous accidents." This information gap was particularly concerning for elderly users, who reported that they adjusted their usage patterns based on personal caution rather than informed guidance.

3.5 Statistical Comparisons: Effects of Demographics and Park Location

A comprehensive analysis of variance testing revealed several important patterns in how different user groups perceive and experience equipment risks during rainy conditions. The one-way ANOVA examining age effects (Table 4) demonstrated no significant intergroup differences ($F(2,237) = 1.43$, $p = 0.24$), suggesting that the usability limitations imposed by rainy conditions affect all age groups equally. Similarly, the two-way ANOVA examining park location and gender effects (Table 5) showed no significant main effects for park ($F(1,236) = 1.66$, $p = 0.098$) or gender ($F(1,236) = 0.71$, $p = 0.41$), and no significant interaction effect ($F(1,236) = 0.94$, $p = 0.33$).

Table 4. One-Way ANOVA: Effect of Age on Equipment Usability Scores

Source	Sum of Squares	df	Mean Square	F	p
Gruplar Arası	0.78	2	0.39	1.43	0.24
Grup İçi	64.8	237	0.27	—	—
Toplam	65.58	239	—	—	—

The practical significance of these null findings was further investigated through effect size analysis. The obtained eta-squared values were consistently minimal (η^2=0.005-0.012), indicating that demographic factors and park location account for less than 1.2% of the variance in usability scores. Post hoc power analysis confirmed robust statistical power ($1-\beta=0.82$), substantially exceeding the conventional 0.80 threshold. This combination of small effect sizes and adequate power provides compelling evidence that the non-significant results reflect the absence of demographic and locational influences rather than methodological limitations.

Table 5. Two-Way ANOVA Results (Park × Gender Interaction)

Factor	Sum of Squares	Df	F	p	Effect Size (η^2)
Park	0.61	1	1.66	0.098	0.012
Gender	0.26	1	0.71	0.41	0.005
Park × Gender	0.34	1	0.94	0.33	0.007
Error	43.7	236	—	—	—
Total	44.91	239	—	—	—

4. Discussion and Conclusion

The application of the L-type matrix method to assess the risks of rainy weather on outdoor fitness equipment reveals a clear and pressing public safety issue. The data show that seven of eight equipment pieces fell into the "high-risk" category, with the Elliptical Bike (B2) reaching "very high-risk" status. These quantitative findings are strongly supported by the qualitative reports from the participants, where 81% described significant slipping hazards. This alignment between numerical data and user experience firmly establishes that rainy conditions create substantial and measurable dangers. The significance of this finding grows when viewed alongside the typically reactive nature of consumer product safety regulation. As Midgett and Middelberg (18) point out, the current system often waits for problems to emerge rather than preventing them, which means equipment like this is rarely subjected to exhaustive safety testing before public installation. The present study provides a proactive risk assessment to address this gap.

The primary risks identified—surface slipperiness, water accumulation, and corrosion—echo findings from other environmental safety studies. Similarly, Lin et al. (13) noted that environmental stressors compromise safety during outdoor exercise, whereas Yin et al. (26) directly linked increased slip and injury rates to precipitation. The problem runs deeper than the surface conditions, touching the ground beneath the equipment. Jiang et al. (27) and Lian et al. (28) demonstrated that rainwater seepage can weaken soil stability, demonstrating that the safety of these fitness areas fundamentally depends on their foundational integrity. The real-world health impacts of such hazards are severe. Kim's (15) large-scale study of geriatric patients confirmed that environmental causes lead to more outdoor falls, particularly in sports and leisure scenarios. This clinical evidence transforms the abstract risk scores into tangible public health concerns, particularly for vulnerable groups.

One of the most telling outcomes was the dramatic variation in the risk levels with the design of the equipment. The elliptical bike (B2) emerged as the most dangerous due to its dynamic operation and the user's constant need for stable footing. This finding is based on solid biomechanical principles. Lysdal et al. (29) established a clear connection between shoe-surface friction and injury mechanisms, showing that a 63% reduction in friction coefficient led to a 53% decrease in severe ankle sprains. The results imply that the high friction between a user's foot and the wet surface of a dynamic machine such as the Elliptical bike triggers a comparable injury mechanism, fully warranting its "very high-risk" classification. Conversely, the static arm cycle (B7) presented a lower, but still concerning, "high" risk. This concept—that design dictates performance under stress—resonates with structural engineering principles. Long et al. (30) stressed that interface treatments and structural design are pivotal for composite beam durability and crack resistance. Similarly, the user-equipment interface is paramount for safety in wet conditions.

A notable finding emerged from the statistical analysis, which indicated an absence of significant disparities in risk perception across gender, age, or educational attainment levels. This perception of uniformity suggests that regardless of demographic characteristics, environmental hazards exert a consistent influence on user experience. However, this perceptual homogeneity does not correspond to the outcomes of equivalent injuries. Empirical evidence from Kim (15) demonstrates that specific demographic factors, particularly male gender and head/neck trauma, significantly predict severe injury consequences following outdoor falls among the elderly. This critical distinction reveals that while hazardous conditions uniformly affect all users, the resulting injury severity demonstrates demographic-specific patterns, emphasizing the imperative for implementing universal safety standards that accommodate differential vulnerability across population subgroups.

The L-type matrix method was exceptionally well-suited for this analysis. The crucial decision to redefine the "probability" parameter as O = 2 - Usability Score was fundamental; it allowed for the accurate identification of high-risk levels, transitioning from simply measuring usability to actually quantifying accident likelihood. This successful adaptation highlights the importance of customizing risk assessment tools to fit specific contexts. The effectiveness of such systematic frameworks is well documented in various sectors: Rivera Domínguez et al. (24) applied a preliminary hazard analysis in the automotive industry, Zhang and Mohandes (25) created a comprehensive framework for green buildings, and Schneider et al. (20) established a prevention model for outdoor sports. Together, these studies affirm that structured risk identification forms the bedrock of proactive safety management.

4.1 Implications and Recommendations

The prevalence of high and very high-risk levels demands immediate attention and action from local governments, urban planners, and public health authorities. The recommendations are structured using the adaptation model by Schneider et al. (20) and the ALARA principle (As Low As Reasonably Achievable) from industrial safety (24).

Technical and Structural Measures: This line of defense is paramount and requires a fundamental shift in equipment design. Inspired by the clinical success of the low-friction "Spraino" device (29), manufacturers should research the integration of controlled slip thresholds into high-risk equipment. Exploring advanced materials, such as UHPC for structural components (30) and SLIPS for surface coatings (31) holds considerble potential. Effective drainage, informed by geotechnical research on slope stability (27, 28), is essential.

Organizational Measures and Concepts of Action: Immediate, practical steps are needed for "very high-risk" equipment. This includes implementing proactive maintenance, potentially leveraging AI-assisted sensors (32), and establishing clear, visible warning systems for wet conditions.

Prioritizing Vulnerable Users: The equipment design must explicitly safeguard older adults and other vulnerable groups. Given the findings on severe outdoor fall injuries (15), extra precautions such as additional handrails and highly visible warnings in areas frequented by seniors are critically important.

Policy and Education: Considering the reactionary stance of consumer product regulation (18), advocating stricter, pre-emptive safety standards for public fitness equipment. Public education campaigns are needed to inform users about the risks and promote safe practices.

This study provides quantitative proof that rainy weather poses serious safety risks to outdoor fitness areas. The findings consistently indicate that environmental conditions are the primary risk-determining factor. This reality compels a fundamental shift in approach—from reacting to accidents to proactively managing safety—a philosophy championed across fields from green building construction (25) to sports climate adaptation (20). Implementing the multi-level strategy detailed here is not only an improvement but also an essential step toward creating sustainable, user-friendly, and genuinely safe urban physical activity infrastructure.

Authors' Contributions

All authors equally contributed to this study.

Declaration

In order to improve the academic writing and language quality of this manuscript, the authors used the language model ChatGPT (version 5.1). The authors take full responsibility for the content of the manuscript.

Transparency Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

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Declaration of Interest

The authors report no conflict of interest.

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Ethical Considerations

This study was conducted in accordance with the principles of the Declaration of Helsinki. Participation in the survey was voluntary, and informed consent was obtained from all participants. The questionnaire was anonymous, and no personal identifying information was collected.

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