

The Factors Influencing Outdoor Fitness Equipment Usage for the Middle Age Group at Urban Parks in Klang Valley, Malaysia

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ABSTRACT

Outdoor Fitness Equipment (OFE) installed in urban parks is increasingly promoted as a low-cost, accessible intervention to increase population-level physical activity. However, evidence regarding user characteristics, motivations, and contextual barriers particularly among middle age adults (15–64 years) which based on Department of Statistic Malaysia (DOSM) 2023 remains uneven, with limited Malaysia-focused studies. This paper presents a comprehensive, design-anchored mixed-methods investigation framed within Design and Development Research (DDR) to examine the determinants of OFE usage in Klang Valley urban parks. The study integrates structured surveys (n = 270), semi-structured interviews (n = 5), and ergonomic observations across six representative parks to interrogate four theoretically derived constructs: Accessibility, Social Environment, Design and Usability and Meteorological Conditions. Findings reveal that proximity, route connectivity and perceived safety drive park visitation, social facilitation and group-based activities increase equipment uptake, equipment affordances, instructional clarity and ergonomic compatibility determine sustained use and climatic stressors reduce frequency and duration of sessions. The paper advances a contextualized conceptual framework linking Theory of Planned Behavior (TPB) and inclusive design principles to OFE adoption. Practical recommendations for planners and designers including siting heuristics, modular ergonomic standards, and community-based activation programs are provided. The manuscript includes an updated literature synthesis emphasizing Malaysia (2020–2025) and discusses policy implications for park programming and public health promotion.

Keywords: outdoor fitness equipment; urban parks; middle age adults, accessibility, ergonomics, Klang Valley.

1. INTRODUCTION

Physical inactivity is a recognised global risk factor for non-communicable diseases and premature mortality (Baker & Lee, 2021). Urban public spaces most notably parks constitute an important component of population-level health promotion because they offer free or low-cost venues for incidental and organised physical activity (Lee & Park, 2019). Governments and municipal authorities in Malaysia have invested in public park amenities, including Outdoor Fitness Equipment (OFE), to broaden access to exercise opportunities. Despite widespread installations, empirical evidence on OFE usage patterns, user needs, and design efficacy in Malaysia remains limited.

Middle age cohorts are a strategic target for early preventive interventions because lifestyle modifications in this period can delay or mitigate chronic disease

onset. National demographic datasets demonstrate that the Middle age is a working-age population (15–64) remains large in Malaysia, yet the middle age subsegment faces competing time demands, care responsibilities, and emerging musculoskeletal constraints all factors that may influence OFE engagement (Department of Statistics Malaysia, 2023). The research responds to an external examination report that highlighted definitional ambiguities, methodological gaps as mentioned elsewhere (Rahim, Ariff & Omar, 2025; Rahim et al., 2025; Rahim et al., 2024; Omar et al., 2022; Ariff, 2020; Ariff, Eris, & Badke-Schaub, 2013; Ariff, Badke-Schaub, & Eris, 2012; Ariff & Badke-Schaub, 2011), and the need to anchor findings in behavioural theory. In doing so, the paper adopts a DDR approach and positions its contribution at the intersection of design, urban

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planning, and public health. The central research question is ‘What factors influence the uptake and sustained use of OFE among middle-aged adults in Klang Valley?’ and ‘How can design and planning interventions be operationalized to increase participation?’

2. LITERATURE REVIEW

2.1 OFE and public health: Global and regional evidence.

Outdoor fitness equipment (also referred to as outdoor gyms or calisthenics parks) has been adopted internationally as a public-health intervention to increase access to physical activity. Systematic reviews summarise heterogeneous evidence: OFE installations increase park visitation and can facilitate light to moderate physical activity, but rigorous randomized evaluations remain rare (Jansson et al., 2019; Jansson, 2025). Recent randomized and quasi-experimental studies show promising effects of structured OFE-based resistance training on physical fitness among middle age and older adults (Marcos-Pardo et al., 2024). Seminal qualitative work by Hsueh-Wen Chow (2013, 2017, 2019) established foundational knowledge on usage patterns, perceived safety, and instructional

deficiencies. Chow's observational and interview-based studies demonstrate that device-specific affordances, unclear instructions, and habitual behaviours shape OFE interaction patterns. These findings remain relevant to Malaysian contexts where equipment diversity and maintenance vary across municipalities. (Chow, 2013; Chow, 2017).

2.2 Theoretical foundations: TPB, Inclusive Design, and Social-Ecological Models.

The study integrates Theory of Planned Behaviour (Ajzen, 1991) to explain intention-behavior relations, Inclusive Design principles to frame ergonomic and inclusive design considerations, and Social-Ecological Models to account for multilevel influences (individual, interpersonal, environmental, policy). TPB's constructs—attitude, subjective norm, and perceived behavioural control—map directly to user perceptions, social facilitation, and perceived usability of OFE. Inclusive Design offers principles for accessibility and usability across a range of functional capacities, critical when targeting middle-aged cohorts with heterogeneous mobility and strength profiles. Figure 1 shows the summative diagram of these theoretical foundations.

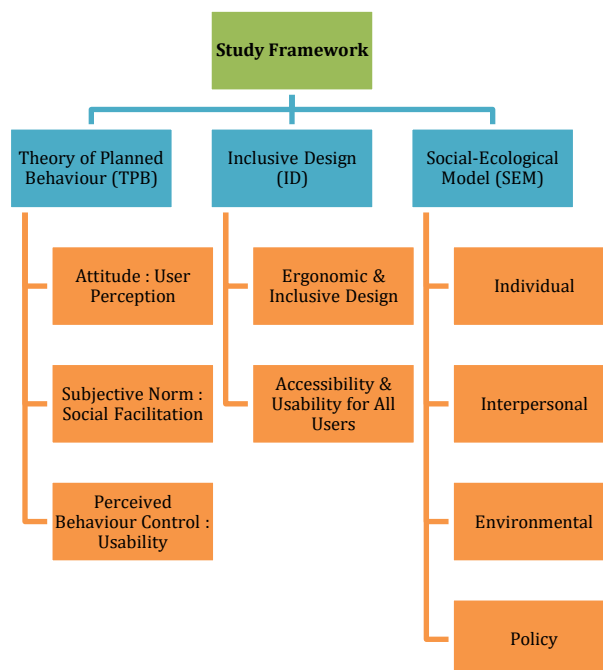


Figure 1. Theoretical foundations integration of the research

2.3 Four constructs: Accessibility; Social Environment; Design & Usability; Meteorological Conditions.

Accessibility encompasses proximity, route connectivity, first/last-mile considerations, and perceived safety. Empirical work demonstrates that parks within walking distance see higher visitation and equipment use (Veitch et al., 2017). Social environment includes peer support, organised programming, and social norms that influence regular participation (Cranney et al., 2024).

Design and usability focus on device ergonomics, adjustability, instructional clarity, and perceived risk. Ergonomic mismatches (e.g., seat height, grip size) reduce adoption among middle-aged users (Shores & West, 2010). Meteorological conditions temperature, humidity, and rainfall—are non-negligible determinants in tropical contexts and moderate seasonal patterns of outdoor exercise (Li et al., 2021; Senol, 2023). Figure 2 shows four key constructs influencing outdoor fitness engagement.

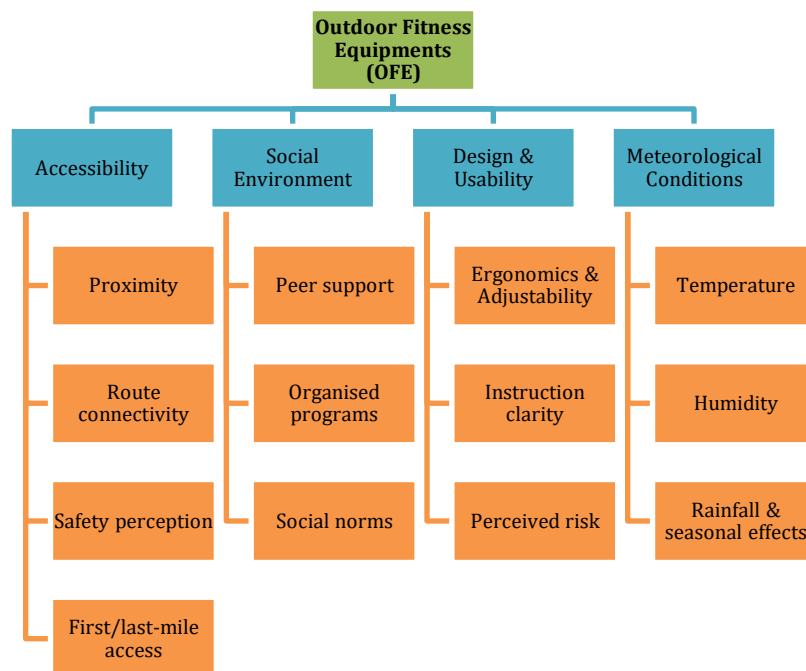


Figure 2. Four key constructs influencing outdoor fitness engagement

2.4 OFE research in Malaysia and leading scholars.

Malaysia-specific OFE literature is growing but still smaller in scale compared with Australia, Taiwan, and parts of Europe. Notable Malaysian studies include Rahman & Karim (2023), which analysed barriers and facilitators to OFE engagement in Malaysian urban parks, and Jamil & Sulaiman (2020), which examined green space policies influencing recreational use in Kuala Lumpur. These authors, along with regionally influential scholars such as Hsueh-Wen Chow (Taiwan) and Cranney et al. (Australia), form the core literature that this manuscript builds upon.

Key scholars and groups to note: Hsueh-Wen Chow (Taiwan) observational and qualitative studies on OFE; Laura Cranney and colleagues (Australia) systematic reviews and qualitative synthesis on OFE; Rahman & Karim (Malaysia) Malaysia-focused barrier analysis; Marcos-Pardo et al. (Spain) controlled trials on resistance training using OFE. Where possible this manuscript emphasises Malaysia-centred findings and situates them within this scholarly network.

3. RESEARCH METHODOLOGY

3.1 Research design

A Design and Development Research (DDR) framework was applied to create a feedback-driven iterative study that combines theoretical development, empirical needs analysis, and design validation. DDR is appropriate because the study aims to produce a practical design framework and test its applicability in real-world park settings (Richey & Klein, 2007).

3.2 Sampling and study sites

Six public parks in Klang Valley were purposively selected to represent a range of neighbourhood contexts (inner-city, suburban, high-density, amenity-rich). The study targeted middle age (15–64 years) who used park

facilities and OFE. A purposive, quota sampling approach ensured representation across gender, age subgroups and habitual exercise frequency.

3.3 Data collection

Three complementary instruments were deployed:

- A structured survey (n = 270) capturing socio demographics, park visitation patterns, OFE usage frequency, perceived barriers, and TPB constructs.
- Semi-structured interviews with 5 purposively selected participants (including frequent, occasional, and non-users) to capture motivations, perceived risks, and suggestions for design.
- An ergonomic observation checklist and usage audit (over 12 hours of observation) to quantify device interactions, incorrect usage patterns, and age-related adaptations, following protocols adapted from Chow (2019).

3.4 Data analysis

Quantitative data were analyzed using descriptive statistics, cross-tabulations, and simple logistic regressions to identify predictors of regular OFE use. Qualitative interviews were transcribed and analysed thematically using NVivo coding protocol's themes were triangulated with observational findings to strengthen construct validity.

3.5 Ethical considerations

Ethical approval was secured from the university's Human Research Ethics Committee. Participants provided informed consent and data were anonymised. Observational audits followed public-space research norms and avoided recording identifiable personal data.

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3.6 Overview of the research methodology framework

The study employs a **Design and Development Research (DDR) framework**, integrating iterative, feedback-driven processes that combine theoretical grounding, empirical investigation, and design validation. The framework ensures that both conceptual development and practical application evolve in parallel through continuous evaluation loops.

The methodology comprises **five interconnected phases**:

1. **Research Design** – Establishes the DDR structure that merges theory, needs analysis, and validation to develop a design framework applicable to real-world outdoor fitness contexts.
2. **Sampling and Study Sites** – Involves six purposively selected public parks across Klang Valley representing diverse urban typologies, with quota sampling targeting middle age (15–64 years) across gender and exercise frequency categories.

3. **Data Collection** – Utilizes a mixed-method approach consisting of (i) a structured survey ($n = 270$), (ii) semi-structured interviews ($n = 5$), and (iii) ergonomic observation checklists conducted over 12 hours to document user behaviour and equipment interaction.

4. **Data Analysis** – Quantitative data are analysed using descriptive statistics, cross-tabulations, and logistic regression to identify behavioural predictors, while qualitative data undergo thematic coding via NVivo, with findings triangulated for validity.

5. **Ethical Considerations** – Ethical clearance was obtained from the institutional Human Research Ethics Committee, with informed consent and anonymity maintained. All observational data followed public-space research ethics.

Collectively, these phases form a **coherent DDR process** that aligns theoretical insight with practical design development, ensuring that the resulting framework for outdoor fitness equipment is both empirically grounded and user centred. Figure 3 shows the flow of the research methodology framework.

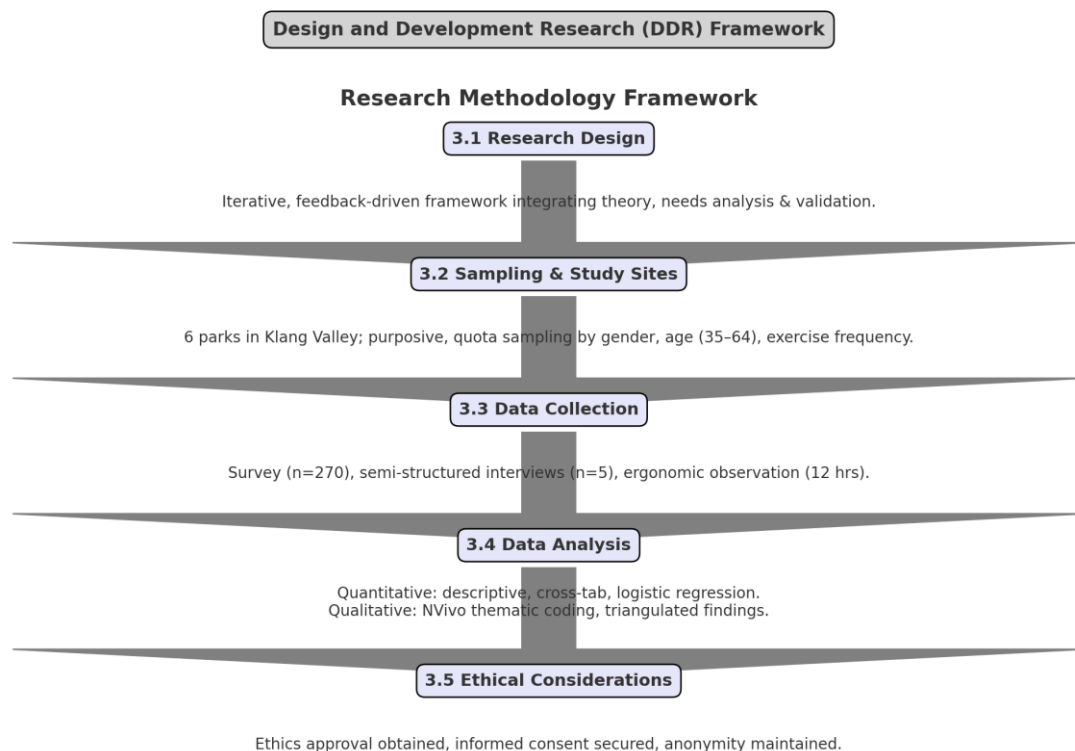


Figure 3. The flow of the research methodology framework.

4. FINDINGS

4.1 Sample characteristics

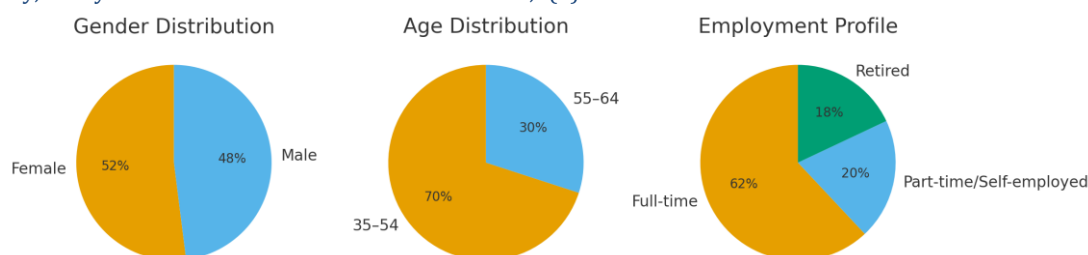


Figure 4. Demographic profile of survey respondents (n = 270).

Figure 4 illustrates the demographic composition of the survey respondents (n = 270) who participated in this study. The sample comprised **52% female** and **48% male** participants, indicating a nearly balanced gender distribution, which supports the representativeness of the middle age urban population in the Klang Valley. In terms of age, the majority of respondents (70%) were within the **35–54 age range**, while **30%** were between **55 and 64 years old**. This distribution aligns with the study’s target demographic of middle age adults, a group considered to be at a transitional stage between active employment and gradual lifestyle adjustment toward health-conscious leisure activities.

Employment status showed considerable diversity: **62%** of respondents were employed full-time, **20%** engaged in part-time or self-employment, and **18%** identified as retired. This employment profile reflects a socio-economically active cohort with varying levels of time flexibility and access to recreational spaces. Educational backgrounds were largely concentrated at the **secondary and tertiary levels**,

suggesting moderate to high awareness of health and fitness benefits.

Overall, these demographic characteristics are consistent with the **urban middle age population of the Klang Valley**, an area known for its mixed residential density and well-developed park infrastructure. The relatively high proportion of working adults underscores the need for conveniently located and accessible outdoor fitness facilities that accommodate time-constrained users. The demographic balance presented in **Figure 4** thus provides a solid foundation for analysing behavioural patterns, accessibility preferences, and usage trends related to outdoor fitness equipment in public parks.

4.2 Accessibility findings

Proximity emerged as the strongest predictor of park visitation: respondents living within a 15-minute walk of the park were 2.3 times more likely to report weekly OFE use (logistic regression OR = 2.3, $p < 0.01$). Route quality (sidewalk continuity, lighting) and perceived safety also correlated positively with frequency.

4.3 Social environment

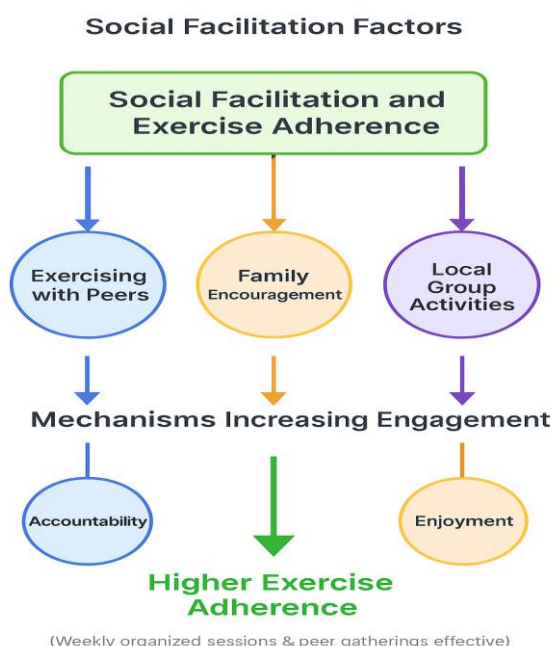


Figure 5. Social facilitation factors.

Social facilitation—exercising with peers, family encouragement, and local group activities—was associated with higher adherence. Interview narratives

emphasised accountability and enjoyment as primary mechanisms by which social ties increased engagement.

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Organized weekly mornings and informal peer gatherings were particularly effective.

4.4 Design and usability

Observation and interview data revealed common usability problems: unclear instruction panels, non-adjustable components incompatible with shorter or heavier users, and surfaces that became slippery in wet conditions. Users suggested modular features (adjustable seat height, variable resistance) and clearer pictorial instructions to reduce uncertainty and injury risk.

4.5 Meteorological conditions

In the tropical Klang Valley, heat and sudden rainfall limited mid-day participation. Users preferred early morning or late-afternoon slots; shaded installations and water access were recurrent recommendations. Statistical analysis showed a 27% reduction in average session duration on days classified as 'hot' (temperature > 32°C) compared with milder days.

4.6 Conclusion of Findings

The findings collectively reinforce that **engagement with outdoor fitness equipment (OFE)** among middle age adults in Klang Valley is influenced by an interplay of **accessibility, social environment, design usability, and climatic conditions**. The results provide empirical validation for the proposed framework grounded in the Theory of Planned Behaviour (TPB), Inclusive Design (UD), and the Social-Ecological Model (SEM), where behavioural intention, environmental support, and design inclusivity converge to determine consistent participation.

From the **sample characteristics**, the demographic profile—dominated by urban, full-time employed adults aged 35–54—reflects a cohort that values convenience, comfort, and safety in park-based exercise. This demographic also underpins the need for accessible and inclusive facilities capable of accommodating varying physical abilities.

Accessibility emerged as the strongest structural determinant of participation, where proximity and route connectivity significantly predicted usage frequency. This indicates that even well-designed equipment remains underutilized if physical access or route safety is compromised.

The **social environment** played a crucial motivational role: participants highlighted the importance of social facilitation, peer accountability, and community programs in sustaining adherence. This dimension underscores the behavioural influence of subjective norms and shared enjoyment, aligning with TPB's social components.

In terms of **design and usability**, both observational and qualitative data revealed a gap between design intent and real-world user diversity. Equipment lacking ergonomic flexibility—particularly non-adjustable

dimensions and unclear instructional design—reduced usability among older or physically constrained users. Such findings reinforce the value of Inclusive Design principles emphasizing adjustability, clarity, and inclusivity.

Lastly, **meteorological factors** demonstrated a significant moderating influence, where extreme heat and rainfall directly curtailed exercise duration and frequency. The preference for shaded areas and early-morning sessions suggests that climatic adaptation strategies are essential to ensure sustained engagement in tropical environments.

In synthesis, the results affirm that effective OFE design and implementation require an integrated approach combining **spatial accessibility, social support structures, user-centred design, and environmental adaptation**. These dimensions together inform the subsequent development of the **proposed design framework**, which aims to enhance usability, inclusivity, and long-term adherence among middle age park users.

DISCUSSION

The findings confirm the salience of the four constructs and extend existing literature by contextualising them within Malaysia's tropical urban setting. The strong association between proximity and usage echoes international studies (Veitch et al., 2017) and underscores the planning imperative for distributed, neighbourhood-level OFE installations.

Social environment findings resonate with TPB: subjective norms and perceived social support significantly influenced intentions and self-reported behaviour. This suggests that OFE interventions should be paired with community activation programs (walking groups, instructor-led sessions) to convert interest into routine behaviour.

Design and usability insights point to modifiable engineering and procurement practices. Procuring devices with adjustable features and durable, weather-resistant surfaces will improve inclusivity and reduce maintenance burdens. Embedding standardized pictorial instruction grounded in participatory co-design (involving middle-aged users) will reduce misuse and perceived injury risk.

Meteorological constraints are particularly relevant in Malaysia. While structural shading can mitigate heat exposure, complementary programmatic strategies (time-shifting, indoor rainy-day alternatives) are necessary to maintain continuity in physical activity.

6. Practical Recommendations

Based on the findings, several practical recommendations are proposed to enhance the usability, safety, and long-term sustainability of outdoor fitness equipment (OFE) installations.

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- **Site Selection & Distribution:** Prioritize neighborhood-level OFE near high-density residential areas with strong pedestrian networks.
- **Design Specifications:** Procure modular, adjustable equipment with clear, multilingual pictorial instructions and weather-proof materials.
- **Programming & Activation:** Establish community-based routines (e.g., 'park fitness ambassadors') and

partnerships with local health agencies to run scheduled workshops.

- **Maintenance & Safety:** Regular inspections, anti-slip surfaces, and timely repairs to avoid disuse due to perceived hazards.

- **Policy Integration:** Incorporate OFE standards into municipal park design guidelines and link to public health promotion strategies.



Figure 6. Practical recommendations for OFE.

7. Contributions, Limitations, and Future Research

This manuscript contributes empirically to Malaysian OFE literature by (1) providing a large mixed-methods dataset, (2) developing a contextualized conceptual framework grounded in TPB and Inclusive Design, and (3) offering actionable design and planning recommendations. Limitations include non-probability sampling, cross-sectional survey design limiting causal inference, and limited seasonal coverage. Future work should pursue longitudinal designs, randomized facility upgrades, and cost-effectiveness analysis.

CONCLUSION

OFE represents a promising, equitable tool to promote physical activity in urban parks. For middle age population in Klang Valley, optimally sited, ergonomically designed, and socially activated OFE can enhance participation and contribute to healthier urban communities. Translating these findings into municipal policy and procurement practice will require cross-

sector collaboration between planners, designers, public health agencies, and local communities.

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