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The Effect of Different Built Environments on Walking Behavior Among Women in Riyadh

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Abstract: This paper aims to comprehensively examine how the characteristics and perceptions of various built environments influence the walking experiences of women in open public spaces within Riyadh. The study identifies various urban walking settings and investigates the multifaceted barriers and motivations that impact women's walking behavior in these environments. Employing a mixed-methods approach, this research integrates observational analyses conducted across four walking sites and semi-structured interviews with participants to gather rich qualitative data. The findings suggest that specific attributes influencing women's walking experiences are closely related to the built environment, including factors such as ease of accessibility and the existence of essential amenities. Furthermore, the research highlights that those social and cultural factors, such as the presence of other women in these public spaces, significantly affect women's willingness to engage in walking activities. Overall, the results highlight the considerable progress still needed to establish a pedestrian environment that is both comfortable and inclusive, ultimately contributing to the humanization of urban spaces in Riyadh. The study adds to the existing body of knowledge on urban walking behavior among women and emphasizes the importance of creating supportive environments that encourage active participation in public spaces.

Keywords: Walking, built environment, Women Pedestrians.

1. Introduction

Walking is among the most widely practiced forms of physical activity and is known for its health benefits. It is typically understood to be a short-distance movement from one place to another in an urban setting (Rafiemanzelat et al., 2017). In addition to being promoted as a physical activity by health researchers, walking is also introduced by urban designers as a social, recreational activity (Gehl & Gemzøe, 2001). Walking is one of the simplest physical activities a person can do daily as it does not require special equipment or a specific place and can be done at any time and by all age groups. Despite its simplicity, it is one of the most significant contributions to improving people's quality of life because it enhances psychological well-being by boosting daily physical activity, improving mood, reducing depression, and fostering a sense of community and belonging, thereby giving a unique identity to the built environment for both residents and users (Rafiemanzelat et al., 2017).

It is essential to create an encouraging environment for people in Saudi Arabia to engage with their city and its urban facilities to create a healthier lifestyle. 2018 the "quality of life program" was established as part of the "Saudi Vision 2030". The program seeks to enhance the

quality of life in Saudi Arabian cities by upgrading infrastructure, transportation, urban design, and environmental factors. Additionally, it promotes social participation by encouraging citizens to engage in cultural, entertainment, and sports activities by developing citywide facilities.

However, achieving a quality of life is not easy without understanding people's behavior and why, for example, they prefer to walk in particular places and avoid others. Some public health literature has argued that the physical environment can affect physical activity behavior (Cerin et al., 2007).

Typically, recreational walking is practiced in open public spaces as the main component of the outdoor built environment. These areas offer opportunities for leisure activities and locations for outdoor fitness, social gatherings, and visual enhancements (Koohsari et al., 2015; Lee et al., 2018). Open public spaces, within urban design, architecture, and outdoor planning, play a crucial role in the urban built environment (Han et al., 2022). They stand apart from private spaces, primarily accommodating individual needs (Han et al., 2022). Thus, studies have shown the importance of planners' awareness that pedestrians are not a uniform group but individuals with different needs (Ovstedal & Ryeng, 2002).

However, there is a gap in understanding the specific factors that contribute to women's perceptions of the built environment in open public spaces and how these perceptions influence their use and engagement with these spaces, especially in Saudi Arabia, Riyadh. Addressing this gap is essential for informing urban planning and designing strategies that promote inclusivity, equity, and well-being for all community members.

Thus, this study has involved considerable work to find a connotation between physical environments and people's physical activities, precisely focusing on walking.

2. Research Problem

The built environment has an essential role in shaping physical activity behavior, particularly for walking as the fundamental and most accessible form of exercise. However, there can be wide variations in how different built environment factors affect walking behavior among other members of the community. Hence, there is a limited understanding of how different built environment aspects could encourage or limit women's walking in Saudi Arabia, which could require specific considerations and needs with regard to the unique social and cultural characteristics of the society and the women's distinct role in Saudi Arabia, which requires research attention to accommodate women's needs for walking in urban areas of cities in Saudi Arabia.

3. Research Objectives

The research aims to investigate how the characteristics and perceptions of different built environments affect the walking experience among women in Riyadh through three main objectives:

1. Identify the different urban settings available for women to walk in Riyadh.
2. Determine the environmental elements associated with increased walking among women.
3. Identify the environmental barriers that impact walking behaviour among women in Riyadh.

4. Research Questions

1. What are the challenges and barriers of the physical environment that women face when walking in Riyadh?
2. What factors of the built environment that could motivate more women to walk in Riyadh?
3. What different types of built environments are more encouraging for women to walk?

5. Research Significance

This study will provide valuable insights into how women's walking behavior is influenced by built surroundings, which can direct the design of more effective walking environments. The research targets a significant population and offers recommendations to enhance physical activity and general well-being by concentrating exclusively on women, in addition to creating a livable society. Hence, contributing to the "quality of life" program in Saudi Arabia.

6. Literature Review

6.1 Built Environment Impact on Users

Researchers have defined the built environment in various ways, but it is most commonly defined as the portion of the physical environment constructed by human activity (Handy & Sealens, 2008). The physical environment significantly impacts people's physical activity as it can encourage or deter people's walking (Lovasi et al., 2008; Handy & Sealens, 2008). Due to the importance of creating walkable environments for people's health, quality of life, and sustainable living, urban planning researchers extensively discussed walkability concepts in various strategies that aim to decrease private car usage (Banger et al., 2024). The literature on the subject attempts to handle the issue of walking environments from two different sides. The first one measures objective factors that influence the walkability of places. Objective considerations are what could be directly observed or measured, such as street dimensions and networks, land use, slopes, and weather conditions (Banger et al., 2024).

For instance, a previous study by Parashar & Bnayan (2020) investigated and compared the urban design settings and walkability of two different public walking paths in Riyadh. In their research, they connected the design qualities of the built environment and walking behavior among its users and concluded that the availability of parking spots, amenities, and overall design qualities attract and encourage more walking. However, the study fails to acknowledge different users of the walking area as they could have different preferences and needs according to their demographic or social background. Studies have shown that it's essential for planners and designers to be aware that pedestrians are not a uniform group but individual people with different needs (Ovstedal & Ryeng, 2002). Moreover, a systematic review paper of longitudinal studies conducted by Tcymbal et al. (2020) investigated physical activity taking gender into account, proving that the built environment is a determinant of physical activity behavior similarly for both males and females. Nevertheless, their results revealed that in women, the availability of public transport, safe cycling lanes, housing density, and the distance to daily destinations proved to be more relevant regarding their physical activity behavior. Among men, street network characteristics and road environment, such as intersection connectivity, local road density, and the presence of dead-end roads, were the most critical factors. However, previous research has not fully explained the reasons behind specific gender preferences for walking.

Moreover, other studies tackled subjective considerations for walking environments. Subjective factors are hidden variables that cannot be directly measured in the field. They relate to individuals' psychological aspects, like social norms, attitudes, and personality traits, in relation to objective factors (Van Acker et al., 2010). One significant aspect is gender differences, which have a considerable impact on how men and women perceive and engage with the built environment.

Compared to men, women approach a wider range of situations as dangerous (Cops & Pleysier, 2011), and they report a higher fear of crime in outdoor public spaces (Keane, 1998; Pain, 2001). This could lead them to avoid public spaces or limit their outdoor activity, especially during the nighttime or when walking alone (Jorgensen et al., 2013). A large body of literature showed how significant safety concerns, specifically among women, when accessing public spaces (Navarrete-Hernandez et al., 2021). For example, Sadeghi et al. (2023) investigated environmental components related to women's presence in urban spaces and prioritized them; the findings of their study argue that enhancing safety (personal, communal, and psychological) stands out as the primary environmental concern for women aged eighteen and above to be present in urban public areas. Also, Ratnayake (2016) stated that concern for personal safety not only has a negative psychological effect but also restricts a person's freedom and choice to move in a public space, thus limiting its use. However, it is essential to understand that this concept of 'being safe' is objective, and it is not associated with any individual perceptions or feelings (Ruijsbroek et al., 2015, pp. 39-40). On the other hand, 'feeling unsafe' is an emotional concept, which means that people may get the idea that the place might be unsafe whilst being told it is, in fact, perfectly safe (Machielse, 2015). Perceived safety is a broad concept that relates to the feeling

of being free from crime and other unsafe factors (Jansson et al., 2013). In general, these feelings can be separated into two types: environment-related and crime-related perceived safety (Wilson and Kelling 1982; Foster et al. 2010). Environment-related perceived safety is defined as the unsafe perception resulting from environmental features causing physical harm accidents, while crime-related refers to fear caused by the discourtesy of human behavior, such as harassment (Jorgensen et al., 2013).

In terms of safety, men and women have different perceptions of privacy within the built environment. Privacy is a concept that is widely discussed by academics (Kozlov, 2004). It can be defined as the ability to control interactions, to have options and mechanisms to prevent undesired interaction and to achieve desirable communication (Altman, 1976; Rapoport, 1972; Asadpour et al., 2022). Privacy is considered a priority, expectation, value, need, and behaviors, enabling individuals to reflect on the meanings of events and respond to them (Gifford, 2007).

Multiple research studies conducted in the Kingdom of Saudi Arabia have underscored the significance of preserving individual privacy in public areas, with a specific focus on women (Bahammam, 1995; Al-Hussayen, 1996; Al Abdullah, 1999; Alhassan & Németh, 2023). The importance of privacy is rooted in Islamic values, which can and wellalso in real life. To elaborate, Abu-Gazzeh (1995) discovered that women in Saudi Arabia preserve their personal privacy by keeping a considerable distance from any unrelated males who are unaccompanied. Also, Bahammam (1995) argues that outdoor recreational areas in Saudi Arabia frequently do not provide a comfortable environment for women due to their failure to consider the social-cultural dimension of privacy.

Al-Bishawi, Ghadban & Jørgensen (2017) have conducted a study to investigate how women's privacy needs are met through the physical form of public spaces in both old and new urban designs. Using an environmental approach with direct observations and questionnaires, their findings develop a better understanding of the relationship between women's privacy and the physical form of public spaces. They argue that women's unique requirements in relation to public spaces are influenced by culture, so it is essential to recognize and accommodate these needs when designing public spaces.

Elaborating on the sociocultural factor, the Islamic religion puts a considerable focus on the importance of roads as an urban space, providing principles and guidelines to manage road conditions and outline regulations for those who use them, addressing both physical and moral considerations. For example, the main principle is "Kaf Alatha/كف الأذى", which conveys the idea of avoiding actions that would cause harm to others, like obstructing movement or harming pedestrians, whether that harm is physical or otherwise (Abu Zaho, 2018). Hence, the Prophetic Sunnah discourages sitting on the roads because it exposes individuals to temptations and invades the privacy of others. Also, there is an emphasis on the importance of retaining wide roads to accommodate population density and traffic flow (Abu Zaho, 2018). These considerations, among many others in which Islam is highlighting the significance of preserving public roads and areas, might influence the design, the perceptions, and the use of them by people within Islamic societies. Islam as well promotes greeting pedestrians passing by in public spaces, which should encourage social interactions.

6.2 Study Context: Relevant Background

Riyadh, the capital of Saudi Arabia, is experiencing rapid urban growth and an increasing population. During its relatively brief history of modern development, it has transformed from a small, organically developed town into a contemporary megacity, which is now characterized by unrestrained urban expansion and complete reliance on cars for local and city-wide journeys (Al-Mosaind, 2018). Riyadh's initial master plan, designed by Doxiadis Associates in the early 1970s, was centered around automobile usage and horizontal expansion to support population growth (Al-Hathloul, 2017). Planners argue that such a modernistic planning strategy has changed the urban fabric of the city and led to a travel behavior dominated by cars, without explicit steps to promote or support alternative forms of transportation at any level of the city (Almahmood et al., 2017; Al-Hammad, 1993; Al-Hathloul, 1996). As a result, urban spaces rarely included any pedestrians and community engagement during the 1980s and

1990s (Almahmood et al., 2018). Accordingly, indoor environments, such as shopping malls, hosted these urban activities resembling a new form of entertainment (Abalkhail & Al-Naim, 2010).

Shopping malls were introduced to Riyadh in the late 1970s, then these significant, air-conditioned places presented a different shopping character in the form of indoor entertainment (Almahmood et al., 2017). Shopping malls evolved into urban environments where individuals socialize, participate in socio-cultural and recreational activities, and offer shopping opportunities within a comfortable and safe setting (Aydogan & Salgamcioglu, 2017). These reasons, in addition to the socio-cultural influence, could explain why more women in Riyadh use indoor spaces for walking as Almahmood et al., (2017) reported in their research.

However, in the early 2000s, Riyadh experienced an important significant development when the municipality launched an ambitious campaign called "Humanising the City," aimed at restoring the human aspect of urban spaces to encourage healthy activities and promote walking (Bin Ayyaf, 2015). It is when Riyadh municipality acknowledged a notable lack of public urban spaces compared to the city's population, and planners began to rethink these areas to create environments that foster urban activities and engagements. The campaign includes three key types of walking spaces: (1) promenades and walkways; (2) neighborhood parks; and (3) neighborhood sports fields (Almahmood et al., 2017). Riyadh correspondingly has experienced several efforts to promote walking by upgrading or building new walkways near key city landmarks, including public facilities and major commercial streets, aimed to fulfil various goals related to healthy living, social interaction, and enhancing the city's aesthetics, such as Al Tahlia Street (Almahmood et al., 2018). To this day, there is a continuous effort to develop Riyadh's urban landscape as part of the "Humanizing Neighborhoods Initiative" launched in 2020 to achieve Saudi Vision 2030, which focuses on sustainability and quality of life, where creating walkable communities lies at the core of these concepts (Homoud & Jarrar, 2024). A prominent example is Al-Falah neighborhood, which has been selected as one of the earliest neighborhoods to implement walkability strategies under this initiative.

As regards the women's use of these urban spaces in Riyadh, several studies have tackled the subject. For example, Almahmood et al., (2017) studied the impact of socio-culture on walking among young adults in Riyadh. They concluded that young men and women walk across different walkscapes because each has distinct needs, which highlights the necessity of complementing 'universal' spatial qualities with an understanding of socio-cultural norms to create meaningful walkscapes that allow for both genders. Similar point was discussed in Almahmood et al., (2018) in which the main author considered himself as an insider researcher, due to his cultural background and knowledge of the Saudi sociocultural norms and values, and an outsider researcher, due to the gender limitations when it comes to investigate women's needs and perceptions.

7. Research Methodology

To achieve the research objective, mixed qualitative methods are used in parallel. For the first part of the research data were collected through observation of multiple public spaces presenting different walking environments. Using observation as a tool to compare the conditions of other urban areas is appropriate (Zeisel, 1984). Cullen (1961) studied how people may visually observe locations and objects to help them comprehend their immediate surroundings and develop a sense of place. Additionally, Whyte (1980) employed a comparable approach by incorporating observations and analyzing the activities of urban settings as part of the research. Observation was conducted in four different urban public spaces for walking, focusing on the key elements of of observing environmental behavior according to Zeisel (1984) in table 1.

Table (1). key elements of the observation

Actor	Who is
Act	Doing what
Significant others	With whom
Relationships	In what relationship
Socio-cultural context	In what context
Physical settings	Where in the site

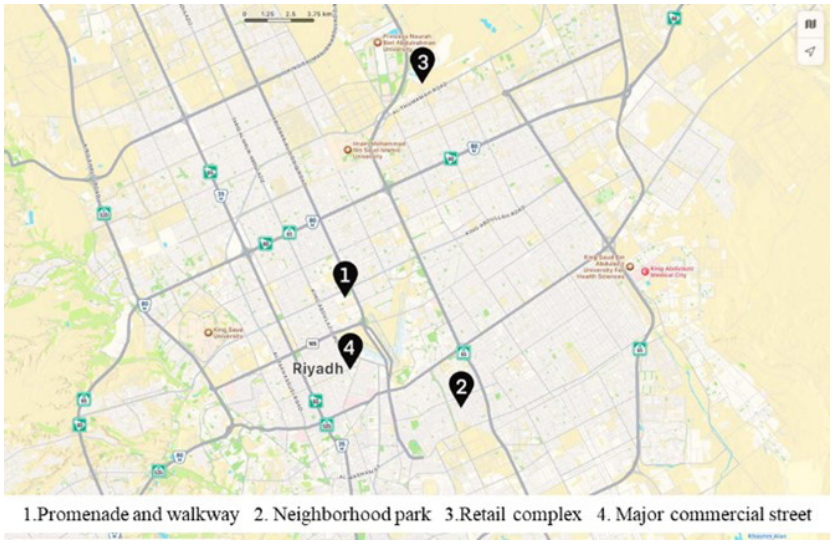

Figure (1). Observation sites (source: author)

Observation locations were selected upon the following criteria: (1) each one must represent a type of walking environment available for women to walk in Riyadh (table 2), (2) locations must be distributed across the city, (3) no specific environmental features, such as the availability of amenities or the size of the area, is required. These criteria facilitate the exploration of diverse walking experiences, physical settings and social environments.

The observation sessions took place on weekdays during the evenings, and each one typically lasted about an hour. During the experiment, notes and photos were collected, in addition to conducting a few on-site interviews with walking women, asking questions regarding the frequency of walking in this area and reasons for preferring it over others. The "on-site interviews" were conducted as informal conversations to gain a deeper insight.

The second part of the research is the semi-structured interviews. Interviews are one of the most extensively utilized methods for obtaining data, as they can help us gain a rich and in-depth understanding of our subject (Dadzie et al., 2018). The semi-structured interview method is used in this research because it maximizes the potential for generating knowledge through dialogues by giving the participants much more freedom to pursue any angles they think important (Leavy, 2014).

Interviews were held through a face-to-face setting or through online calls. Participants were chosen randomly after meeting the eligibility criteria: (1) females aged between 18 and 65, (2) based in Riyadh, and (3) who practiced walking frequently. The main question topics were related to personal walking

Patterns and walking environments preferences and perceptions (table 3).

Table (2). Observation study sites

	Walking space	Location
1	Promenades and walkways	King Abdullah Road walkway
2	Neighborhood parks	Abu Dharr Al-Ghifari Park
3	Commercial development	Roshn Front
4	Major commercial roads	Al-Tahlia Street

Table (3). Interview questions sample

	Interview Questions Sample
1	How often do you walk for leisure or exercise?
2	What times of the day do you prefer to walk?
3	Where do you often walk for leisure or exercise? Why?
4	What places do you avoid walking in? Why?
5	What features in space encourage you to walk more?
6	What features in space discourage you from walking?

Table (4). Examples of applying themes for analyzing interviews

Examples of applying themes for the interviews	
Example	*"I avoid walking in the neighborhood because the cars are very unsafe, and there are garbage containers. Unlike walking in a place designated for walking, I do not feel the time."* **Participant 5**
Themes	**Safe from cars:** because cars are very unsafe
	Well-maintained & obstacles: and there are garbage containers
	Designated walking path: walking in a place designated for walking, I do not feel the time
Example	*"I don't like crowds at all, and I don't like a walkway on a street close to cars."* **Participant 9**
Themes	**Safe from cars:** on a street close to cars
	Overcrowding: I don't like crowds

The interviews were directly transcribed and thematically analyzed using an inductive approach. For the purpose of privacy, each participant was given a number (e.g., Participant 1, Participant 2, etc.).

8. Result

The observational study was conducted from October 16 to October 30, 2024, during at which time the weather in the city began to change to cooler temperatures. This shift in

weather conditions contributed to an increase in the number of people engaging in outdoor walking activities. The table presented below (Table 5) offers a comprehensive summary of the observational results derived from four different public spaces.

Moving to the second set of data, 21 participants were interviewed to explore the various factors influencing women's behaviors regarding walking in public spaces. The identified factors were organized into distinct thematic categories, which are defined at different levels, as illustrated in Table 6. A comprehensive discussion of these themes will be provided in the following section.

Figure (1). Observation sites (source: author)

Table (5). Observational study result

Factors	King Abdullah Road Walkway	Roshn Front	Al-Tahlia Street	Abu Dharr Al-Ghifari Park
Accessibility	Mostly accessible by car as it's surrounded by main roads, with lots of car parking.	Reaching the destination is mostly by car, and many different types of parking are available (paid, free, electric cars, etc.).	Mostly accessible by cars as it is a major commercial road.	The park is encircled by residential areas, making it easily reachable on foot, despite the availability of parking nearby.
Safety	Overall, the place is safe, but its proximity to the street could make it dangerous for children.	Safe for pedestrians as the main walking path is separated from the streets.	Moderate level of safety due to adjacency to the street.	High level of safety, but lacking a fence could be risky for children.
Amenities	Available restrooms and a common praying area, and benches. There is an empty fridge intended for cool beverages and one drinking water tap.	Available restrooms, praying rooms, seatings and benches.	No pedestrian amenities were observed, various types of retail nearby have the potential to provide such facilities.	Available restrooms, praying rooms, and several benches.
Landscape and Design	Well-designed landscape with different green elements, some sports equipment available.	The place is aesthetically pleasing with green landscape available and water features such as fountains and ponds.	Well design landscape, hardscape area for walking and cycling, trees and green features.	The landscape includes two playgrounds, a number of green areas and trees. Hardscape area for walking and cycling.
Activities and Space Use	The area is dedicated only for walking, exercise and cycling, as there are bikes available for rent.	Shops, restaurants and coffeeshops along the walking pathway, also a children's area and a movie theater.	Shops, restaurants and coffeeshops along the walking pathway. bikes available for rent. Some areas observed more people than others.	No significant activities in the park aside from playgrounds for children. It serves primarily as a gathering spot for people to socialize.
Maintenance	Clean and well maintained in general as few paving issues noted.	Well maintained and clean.	Clean and well maintained.	Clean and well maintained.
Environmental Factors	The place is well-lit, available water mists for cooling down the heat. Noisy areas are adjacent to the main roads (Abu Baker Rd).	Well-lit with different lighting patterns. High level of noise due to the variety of activities and high number of people.	The area is well-lit, experiences significant noise from the main street and music emanating from nearby restaurants. unpleasant odors detected from the restaurants along the walkway.	The area is well-lit and experiences noise from children and other park visitors, while the area surrounds the park is quiet.
Social Interactions	The area is active but not crowded. Most people are walking alone, if not, two people together, no groups.	The area is full of people, they were mostly walking in groups, hardly noted someone is walking alone. Shops were relatively empty as most people were setting and walking.	The area is active yet not overly crowded, with a low number of pedestrians. In contrast, there is a higher density of people seated in the restaurants.	The area is active and full of families mostly. Considerable number of people were setting together in groups. Others were walking in a loop around the park.

Table (6). Factors influencing women's walking in public spaces

category	Factors
Individual Level	Availability of time Physical health Purpose of walking
Social/Cultural Environment	Overcrowding Presence of other females Female dress code
Built Environment	Well maintained Designated walking path Accessibility Provided amenities Cyclists Animals Odor and noise level Adequate lighting Safe from cars

9. Discussion

9.1 Walking Patterns and accessibility as a key factor

Analysis of the interview data revealed two primary walking patterns among women: older women tend to walk during the daytime when they have free time. Therefore, they decide to walk indoors, such as shopping malls, due to their controlled setting and protection from weather issues, including heat, sun, and noise. Also, the variety of recreational activities makes their walking experience more pleasant because the primary goal is to keep their physical activity rather than walking long distances, as expressed by research participants.

The second walking pattern, frequently observed among younger women in the study, is to walk for the purpose of exercising and achieving a daily goal of steps. Therefore, the study showed that they walk before working hours, early mornings, or during their break time, within sites near their workplaces: "I walk in a walkway near work because I prefer to walk before I get home. I get busy and don't have time." Participant 6. Alternatively, they walk at night, after fulfilling their responsibilities, such as putting their children to sleep and completing household chores. Accordingly, sites within walking distance from home are mostly chosen. Thus, we could state that ease of accessibility is acrucial factor that could impact women's walking behavior in open public spaces. Some participants emphasize on this factor by reporting that they avoid car rides exclusively for walking: "I walk at home because the point of walking for me is to walk, not to get in the car to a designated walking place." Participant 2 – "I walk in walkways close to my home because I do speed walking, and what encourages me the most is that I can go there on my feet without wasting time." Participant 7. This highlights the importance of choosing walking locations conveniently close to home or the workplace.

9.2 Feeling of safety

However, other aspects could be just as important, such as feeling safe enough to approach the walking space, and findings suggest several factors that contribute to women's assurance in urban spaces, such as adequate lighting. Participants reported the importance of lighting in urban spaces and walking paths as they don't feel safe when it's dark or poorly lit, especially since most participants walk during nighttime: "I am anxious because there are gardens in neighborhoods where there are no lights or people, I am afraid of them." Participant 14. This finding broadly supports the work of previous studies linking lighting with reassurance (Gehl, 2010). One interesting finding is that the presence of other females in the area enhances the feeling of safety among female pedestrians. Participants reported that they avoid places full of men only, and it's a significant consideration to spot other women or groups of families in public spaces to encourage them to walk: "I don't like to walk in places where there are men only. I wish for more family-friendly places." Participant 5 – "I get encouraged to walk when I see girls walking in the area." Participant 1. Earlier studies, such as Valentine (1990), stated that women experience an increased sense of safety in the presence of other people in public spaces, assuming that it will deter potential offenders. However, in this research, participants indicated that the presence of specifically "women" makes them feel safe in public spaces, and it can be attributed to the social norms where some places are considered more appropriate for women than others, as discussed in previous research by Almahmood et al. (2018).

9.3 Environmental factors: obstacles and facilitators

Moreover, participants frequently identified maintenance issues as deterrents to walking in public spaces. For example, the place's cleanliness level is a significant factor for walking women, in addition to the footpath availability and pavement condition as they showed discomfort walking on a disconnected or cracked pavement. Also, provided amenities in the place are important in encouraging more walking women. Participants expressed their need for an appropriate amenity of restrooms and praying areas, reporting that they occasionally interrupt their walking and return home to pray due to the absence of suitable facilities for performing their religious obligations: "It encourages me when there are chairs for rest. Also, the trees and the cleanliness of the bathrooms." Participant 6. Another deterrent to walking in public spaces is overcrowding, where participants reported that it has a significant impact on walking due to the high noise levels and lack of perceived privacy. Therefore, retail complexes appeared to be less attractive places for women to walk for exercise due to the overcrowding, as participants reported them as "noisy and uncomfortable" Participant 2. Nevertheless, the observational findings within the retail complex indicated that a significant proportion of people were engaging in leisure walking rather than shopping. Despite the area being promoted as an outdoor shopping center, the shops appeared relatively empty of customers. This observation highlights a growing desire among the public for urban spaces providing leisure activities within the city.

Coming to other less appealing areas for walking, major commercial streets can deter some females from walking due to several reasons: the presence of seating along the sidewalks where people congregate for street watching and may engage in smoking, noise coming from cars in central streets, unpleasant odors detected from the restaurants nearby. Participants reported that these factors could easily discourage them from walking; "I avoid walking in the streets and roads because of the noise and danger, and the smell there is not always good." Participant 7.

During the observational study, several cats were observed in various locations. The presence of cats or other animals in the area discourages many women from visiting. Participants indicated that they tend to avoid places where cats or dogs with their owners are present, mentioning fear or allergies as their primary reasons: "I avoid the walkway if there are cats or animals in the area." Participant 12 – "I avoid parks because of the cats and insects. I am allergic to them." Participant 3. Additionally, the same concern applies to cyclists and scooter riders, as participants noted feeling uncomfortable walking alongside them due to the fear of potential accidents: "sometimes when I'm walking people on scooters or bikes pass by me and it scares me because they are fast, this makes me change my walking place" Participant 13.

Participants also pointed out the importance of having a source of drinking water or other refreshments around the walking area. "It is hot, and we need things that encourage you to walk, such as the availability of cold drinks and refreshments", Participant 14. Interestingly, during the observation study, empty fridges intended to serve water were noticed, yet they were empty. However, a box of water bottles was voluntarily placed in the same area for pedestrians. This act of social contribution features the cultural values associated with helping others. It reflects a community-oriented mindset that prioritizes the well-being of individuals engaged in outdoor activities, fostering a sense of unity and support. Such initiatives can enhance the walking experience and encourage more people to engage in public spaces.

9.4 Preferred walking spaces

Participants strongly prefer walking in areas specifically designed for pedestrians, as many other spaces in their neighborhood are not conducive to walking. For instance, the absence of sidewalks and lack of pedestrian infrastructure obstruct movement, leading to the perception that these areas are unsuitable for pedestrians to walk in. Additionally, walking on a looped pathway emerged as a motivating factor for participants, as they reported that it provided an encouraging environment for walking., "I like to walk in a continuous walkway because it allows me to finish my steps in one turn and be back home." Participant 4.

9.5 Cultural and social barriers

Interestingly, a few participants identified as regular walkers prefer to walk in their own homes or other private spaces rather than in public urban areas. Concerns regarding dress codes largely

influence this choice: "I like to walk at home because the place is big and I don't need to wear an abaya" Participant 4. As Muslim women in Saudi Arabia, they must be wearing "hijab" or "abaya" in public spaces around men, and it is considered the females' dress code in their culture, which became part of the women's identity. However, "Abaya" in its current design could be uncomfortable while performing physical activities, especially under extreme weather conditions. Consequently, women pedestrians perceive walking in urban public spaces as challenging and choose to walk at home instead. This issue could be addressed by providing women with clothes or "Abayas" choices that can allow thermal comfort and be more practical for walking in public spaces. This is a significant issue because of the emphasis on women's appearance within this socio-cultural context. This study supports evidence from previous research (Almahmood et al., 2017) revealing that gender norms and traditions can limit men and women's access to the city's walkways.

9.6 Addressing the Research Questions

Q1: The study identified several challenges and barriers women face when walking in Riyadh's physical environment. First, the feeling of safety is a crucial factor, as adequate lighting was highlighted as essential for reassuring women and encouraging walking during evening hours. Additionally, the presence of other women in the area also contributed to women's sense of reassurance in this study. Second, areas lack proper footpaths, sidewalks, or pedestrian-specific spaces, making it difficult for women to walk comfortably or safely. Therefore, the pedestrian infrastructure was seen as a major deterrent. Third, environmental discomfort factors, such as noise, unpleasant odors, and the presence of street animals, were reported as deterrents to walking in some urban spaces that negatively affected women's walking experience. Fourth, in some walking environments, such as commercial developments, overcrowding was noted as a major walking deterrent due to the noise and lack of perceived privacy. Finally, cultural barriers such as the dress code requirements for women in Riyadh (e.g., wearing the "hijab" or "abaya") can be uncomfortable, particularly for physical activities like walking in public spaces. Some women preferred private spaces due to this discomfort, limiting their opportunities for walking outdoors.

Q2: When it comes to the factors that motivate more women to walk in Riyadh, the study identified several factors. Creating more pedestrian-only spaces and improving the availability and quality of footpaths and walkways would encourage more women to walk. Pedestrian-specific environments, free from cars and cyclists, would make walking more pleasant and safer. Moreover, accessibility and proximity are significant factors influencing walking behavior. Women prefer walking spaces that don't require driving, so having pedestrian-friendly areas within walking distance from home or workplaces would make walking more accessible. The availability of amenities, such as restrooms, prayer areas, and drinking water stations or refreshments can support women's walking activities as these amenities ensure comfort.

Q3: The study suggest that some types of built environments are more encouraging for women to walk than others. To elaborate, environments explicitly designed for pedestrians, with wide sidewalks, separated from traffic, and offering safe walking paths, are more encouraging. Women in the study preferred areas where pedestrian infrastructure was prioritized, ensuring a safer, more comfortable walking experience. Also, many women saw walking in parks with looped pathways or continuous walking routes as motivating. It provides a sense of continuity and allows women to complete their walking activity without interruption in a comfortable and less crowded environment. Hence, we can conclude that promenades and walkways, in addition to neighborhood parks in general, are the most favorable walking environments for women. Then, there are commercial developments, and lastly, there are major commercial roads. The reasons could be because they suffered from unpleasant environmental factors, as the participants in the study reported, such as the noise, odors, and overcrowding that affect perceived privacy. It should be mentioned that indoor walking environments, such as shopping malls, are still considered preferable by woman, particularly among older ages, for its controlled environments, recreational activities, and provided amenities.

9.7 Study Limitations

Finally, this study has limitations that must be acknowledged. The observational research was conducted under varying conditions at each

site, including different week. Therefore, the data collected may give more reliable results if multiple researchers conducted observations simultaneously across various locations and times. Furthermore, the study has a significantlimitation that lies in the fact that different seasons of the year have differentotherconditions that could impact people's urban activities. Hence, the findings may not fully capture the variations in behavior and preferences across all seasons, as weather and temperature can significantly influence how individuals interact with urban spaces.

Despite its exploratory nature, this study offers valuable insights into walking behavior among women in Riyadh aboutto the built environment and provides important considerations for designing urban spaces that encourage walking and physical activity.

10. Recommendations

While initiatives to enhance pedestrian infrastructure are ongoing, considerable progress is still needed to establish a comfortable and inclusive pedestrian environment that contributes to the humanization of urban spaces. However, research shows that women frequently refrain from walking in their neighborhoods for various reasons; instead, they engage in recreational walking in open public spaces. Based on the findings, several recommendations can be made to enhance the walking experience for women in urban public spaces:

Design safe and walkable areas within residential neighborhoods by providing sidewalks that are wide, well-maintained, and free from obstructions. Focusing on creating walkable areas within residential neighborhoods is more convenient for women who prefer not to rely on cars for transportation, and it addresses the need to avoid car rides solely for walking. Improving accessibility and proximity should encourage more women to walk.

Establishing more green spaces and parks in residential neighborhoods attracts families with children, attracting more women pedestrians. These spaces should include seating areas, walking paths, and amenities such as restrooms, praying areas, and refreshment sources supporting longer walks. Additionally, urban areas could consider creating separate zones for pedestrians and cyclists, as women pedestrians expressed dissatisfaction with walking alongside cyclists.

Ensure adequate lighting in public spaces to promote a feeling of safety for women pedestrians. This can increase safety perceptions, especially during evening hours, when most walking activities occur. Implementing well-lit streets, parks, and walkways will provide reassurance and allow women to feel more comfortable. This should attract more female pedestrians, as findings indicate that the presence of other women enhances their feeling of safety.

11. Conclusion

In conclusion, this study contributes to our understanding of women's walking experiences in public spaces, particularly within Saudi Arabia's cultural norms and social practices. The paper examined how various attributes of walking environments in Riyadh can influence women's walking behaviors and the specific challenges female pedestrians face.

Further research would valuable insights to city planners and policymakers about pedestrians' needs. Furthermore, this research could be expanded to explore walking environments and pedestrians' needs in greater detail to develop a spatially contextualized walkability index that reflects people's walking behaviors.

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تـأثير البيئـات العمرانيــة المختلفـة وخصائصهـا على سـلوكيات المشـي لـدى النسـاء في مدينـة الريـاض

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ملخص البحث. تهدف هذه الورقة إلى دراسة تأثير البيئات العمرانية المختلفة على تجارب المشي لدى النساء في المناطق العامة المفتوحة في مدينة الرياض. تم اختيار أربعة مواقع مختلفة لممارسة المشي بمدينة الرياض، والعمل على تدوين وتحليل الملاحظات ودراسة العوامل التي تؤثر على سلوك المشي عند النساء، كما تم إجراء مقابلات مع المشاة النساء للوقوف على الدوافع والقيود التي تؤثر على سلوكيات المشي لديهن. تشير النتائج إلى أن بعض الخصائص التي تؤثر على تجارب المشي لدى النساء مرتبطة ارتباطاً وثيقاً بالبيئة العمرانية، بما في ذلك عوامل مثل: سهولة الوصول، وتوفر المرافق الأساسية. بالإضافة إلى ذلك، يؤكد البحث أن العوامل الاجتماعية والثقافية، مثل: وجود نساء أخريات في هذه الفضاءات العامة، تلعب دوراً كبيراً في تشجيع النساء للمشاركة في أنشطة المشي. بشكل عام، تسلط النتائج الضوء على الحاجة الملحة لفهم متطلبات المرأة واحتياجاتها عند تأسيس بيئة مشي جديدة أو تطوير بيئات المشي القائمة وهو ما يعزز من جودة أنسنة مدينة الرياض.

الكلمات المفتاحية: المشي، البيئة المبنية، المشاة، النساء.