



# The non-sexist public space in the Kingdom of Saudi Arabia

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## ABSTRACT

The Kingdom of Saudi Arabia (KSA) has recently lifted restrictions regarding the mixing of genders and the access rights of women to public space. These reforms call for new public space strategies to accommodate women's needs. Although studies have examined various management and design factors thought to improve women's experiences in public spaces, these studies often lack an evaluative component and do not always convey the significance of each factor. Through Exploratory Factor Analysis and Fuzzy Synthetic Evaluation techniques, we propose a six-factor index that allows officials, practitioners, researchers, and urban inhabitants to assess and improve urban access for women.

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## Introduction

The Kingdom of Saudi Arabia (KSA) has long been one of the most gender-segregated countries in the world.<sup>1</sup> Gender segregation and exclusion have been present in service settings, schools, work environments, restaurants, and coffee shops (Le Renard, 2008; Almahmood *et al.*, 2017). This spatial segregation regime has created divided realms that restrict interactions between men and women.

As part of a new government program launched in May 2018, the KSA has begun relaxing restrictions on the mixing of genders (Carey & El Baltaji, 2018; Nereim, 2018). These reforms have eliminated the traditional notion of a two-gendered public realm, advocating instead for spaces where men and women can both be present. Despite the recent sociopolitical reforms, history is durable: public spaces in KSA developed for decades under the practice of gender segregation and this reform alone will not put an end to cultural restrictions on women in public space.

Nevertheless, the reforms have opened the door to encouraging leaders and advocates to reimagine public space that might support right to public space for women in KSA. As such, we intend in this paper to answer the following research question: What are the design and management strategies that facilitate women's access and use of public space in the KSA?

Public space design and management are major factors shaping social life in the public realm. A number of studies have explored the various strategies assumed to enhance women's experience of, and rights to, public space (e.g. Valentine, 1990; Kallus &

Churchman, 2004; Mahadevia & Lathia, 2019). We build on these studies by developing a robust index that measures women's access to and use of public space. This tool helps quantify key variables and thus enables decision-makers in the KSA to recognize women's needs in public space and alert key stakeholders to these critical concerns during the public space design process. Although this study is linked to a wider range of literature, we explain that the index and findings are not necessarily universal in planning contexts outside of governance regimes such as the KSA.

## Women in public space

Studies across cultures have revealed the influence of gender norms and roles on women's access to public space (Day, 2007; Jin & Whitson, 2014; Al-Bishawi *et al.*, 2017). Fenster (2005) states that women's appropriate behavior, presence, and clothing in public space are constructed by gender norms, traditions, and religion. Others argue that women's fear of public places is a form of exclusion by gender and can constitute gender violence (Pain, 2001; Fenster, 2005; Whitzman, 2013). Women often retreat from public space as a strategy to minimize their feeling of being in danger, which prevents them from having satisfying experiences of everyday life in the city. Nevertheless, socio-demographic factors like age, class, race, immigration status, cultural practices, religion, and education level can also influence women's experience in public space (e.g. Day, 1999a; Koskela & Pain, 2000). Therefore, women in public space should not be discussed as if they are a uniform category while ignoring their internal differentiation across socio-demographic factors.

The efforts of feminist social movements to end male violence against women began in the 1970s, and over time have helped to increase the public consciousness and government responsiveness to gender-based violence (Hall, 2015).<sup>2</sup> These movements have pressed policymakers to reevaluate existing laws and implement new laws to address this important issue (Beitsch, 2018). Nonetheless, many recent social movements have mainly focused on gender violence in workplaces, failing to address the treatment of women in public spaces where opportunities for gender violence are plentiful (Loukaitou-Sideris (2017). We argue that such movements should not be limited to this restricted scope but should address broader concerns about publicity and protection of inhabitants from gender violence in the everyday life of the city.

Research on gender and the built environment in Anglo-American literature has focused extensively on women and their use of public space (Franck & Paxson, 1989; Whitzman, 1992, 2013; Day, 1999a; Pain, 2001; Loukaitou-Sideris & Fink, 2009b). Yet much of this literature does not reflect the current historical moment when the treatment of women and broader gender roles and relationships are becoming a more prevalent issue in the public consciousness (Beitsch, 2018).

## Gendered landscape in urban practice

Despite growing awareness of women's rights and the incremental empowerment of women's social position over the recent decades, public space still fails to be used or accessed equally by women (Boys, 1984; Sur, 2014). We ascribe this failure to long-practiced sexism in the design of public space (Hayden, 1980; Huxley, 2002; Garcia-

Ramon *et al.*, 2004). Because males have historically dominated the fields of architecture and urban planning, urban space has mostly been designed for men (Boys, 1984; Garcia-Ramon *et al.*, 2004). This practice has reinforced the dangerous notion that women's spatial domain should be constrained to the private space of the home (Hayden, 1980).

This practice is even more clearly shown in cities of the KSA. Alongside the urban transformation and rapid growth in population during the oil boom in the 1970s (Al-Hussayen, 1996), a new urban practice mandated gender segregation under the interpretation of a conservative version of Islam during the *Al-Sahwa* movement (Le Renard, 2008).<sup>3</sup> This urban practice was embedded in the municipal spatial planning process and the provision of urban public space (Almahmood *et al.* (2018). For instance, parks were divided into areas for families where single males were not permitted; in addition, only men have been allowed to participate in recreational activities (Almahmood *et al.*, 2018). This spatial segregation was spread across Saudi cities, enabling divided public realms with limited, if any, contact between men and women (Alsanea, 2005; Le Renard, 2014; Almahmood *et al.*, 2017). Public space in KSA has been significantly impacted by this practice, which both decreased the possibilities for social integration across genders and restricted the broader right to the city for women (Lefebvre *et al.*, 1996).

The recent Saudi political and social reform has eased the restrictions of gender mixing, allowing for limited gender-inclusive public space to emerge. This reform has allowed women to be present in public spaces where they had long been restricted or even excluded (Yee, 2020). Although these public spaces offer a platform for bridging and bonding across genders (Putnam, 2007), our interpretation of gender-inclusive spaces must be tempered by their place in a society that has been subjected to gender segregation for so long. As such, this reform demands new urban strategies for public space provision to promote a non-sexist city (Hayden, 1980).

Indeed, concerns about increasingly sexist cities are not limited to the KSA. Recent efforts such as the HerCity<sup>4</sup> toolbox, for example, are intended to make city planning, design, and implementation processes more inclusive by involving women in decision-making (Fabre *et al.*, 2021). This initiative helps urban actors better understand of women's struggles in cities and suggests ways forward for ameliorating these injustices. Nevertheless, no comprehensive way of assessing women's experience of, and right to, public space exists.

The remainder of the paper is split into three sections. First, we introduce our methodology; next, we relate key index factors to the relevant literature; and finally, we discuss our findings and outline future research to test this index in various contexts.

## Methodology

To create this index, we drew from existing literature to extract relevant management and design variables known to enhance women's experiences in public space. After editing and consolidating the variables into a list of 28, we created a questionnaire to elicit opinions from female respondents by asking them to rate the level of importance of each variable. We capture these variables in an index we call the Women-friendly Public Space Index, which we develop by using Exploratory Factor Analysis (EFA) and Fuzzy Synthetic Evaluation (FSE) methods. The following subsections show the process of developing the index.

**Table 1.** Design and management measures that influence women's experience of public space.

Categories	Measures
Lighting	(1) Bright light to encourage use at night
Trees	(2) Trees should be arranged so they do not block visual access, physical access, and lightings
Crossing	(3) Avoid subways and replacing them with footbridges or surface crossing
Pavement	(4) Design walkways and sidewalks so that it has easy movement, avoid digging, and avoid damaged floor
Entrance	(5) The positioning of entrances should be easy and straightforward such that women do not have to walk down passageways to gain access to site (6) Putting transparent glass at the entrances to elevators, stairs, and shops, to facilitate viewing through them before entering
Parking	(7) The parking lot should be located very close to the site (8) Avoid having underground or multi-story car parks (garages)
Painted Walls	(9) Walls painted white, especially in dark areas to improve visibility and make space appear more open
Buildings	(10) Dark, deserted buildings or vacant land on the site reduce comfort and safety (11) Broken windows or facades and dirt in surrounding buildings reduce the comfort and safety of the place
Space	(12) Very large areas reduce comfort and safety (13) Enclosed spaces with limited exits and limited visibility reduce comfort and safety (14) Isolated or invisible spaces reduce comfort and safety
Public Restrooms	(15) The public restroom should be provided in a visible place (16) The public restroom should be well maintained and clean
Maintenance and Cleaning	(17) Physical maintenance and cleansing regime of hard and soft landscaped areas and street furniture
Security	(18) Presence of security personal (19) Presence of security cameras (20) Fencing
Street Vendors	(21) Street vendors provide light and crowd which give a sense of comfort
Activities	(22) Offering a diverse range of activities
Animation	(23) Having a large number of people makes the place safer (24) The presence of single men makes the space dangerous
Privacy	(25) Having only women (families) public space (26) Divide the time to have times for women (families) only and times for single men only (27) Public pace should include spaces where you can have some privacy (e.g. sittings areas with some partitioning)
Location	(28) Placing public space in a gated community

### Variable extraction

We began the procedure by preparing the potential literature using 'women', 'public space', 'design' and 'safety,' and their synonyms as keywords to use in the Google Scholar search engine. Then, we scanned the titles and abstracts of the potential literature and selected relevant publications that focus on exploring management and design variables. In addition, we added seven publications that explore public space related issues specific to the KSA. In total, we reviewed 27 publications which we then analyzed using a rigorous content analysis. From this analysis, we extracted 28 variables which include a range of factors related to the impacts of location, design, management, security, and usage on women's experiences of public space (Table 1).

### Survey design and data process

After finalizing the selected variables into a list of 28, we designed a questionnaire to elicit the views of female respondents on the relative importance of each factor. The questionnaire was part of a web-based survey conducted as part of a larger study related to

gender rights in public space that was conducted in Riyadh, KSA from September 10–28, 2020.

The main survey was conducted using a self-administered web-based questionnaire. The first section consisted of several multiple-choice and fill-in-the-blank questions related to demographics. The second section asks only female participants to rate their perceptions of the 28 design and management variables on a 5-point Likert scale (ranges from 1= ‘strongly disagree’ to 5= ‘strongly agree’).

The web-based survey was distributed using two social media platforms: Twitter and WhatsApp, both social networking applications. We first distributed the web-based survey to direct contacts and groups in WhatsApp. Since WhatsApp is limited to our social circles, we used public Twitter posts to gain more exposure for the survey, following a similar strategy as Hendricks *et al.* (2016). We first posted the web-based survey using one of the author’s Twitter accounts. Then, we asked two Twitter influencers – @ask\_riyadh and @Riyadh\_Voice – to retweet the survey. We chose these two influencers for two reasons: 1) both have over 100k followers (i.e. @ask\_riyadh has 257.1k followers and @Riyadh\_Voice has 104.3k followers); 2) and both post materials and information related to the City of Riyadh, our study’s targeted population. Our original tweet of the web-based survey was retweeted 28 times by other accounts, gaining additional exposure.

We acknowledge that it is impossible to determine whether the web-based snowball sampling technique produces a representative sample of all women in Riyadh or in the KSA. Although this sample might not be representative of all such women, it is representative of women who are somewhat knowledgeable users of public space due to our sampling procedure. In addition, we understand that web-based survey is limited only to those who have access to the internet. However, according to World Bank (2021), Saudi Arabia’s internet users reach 100% of the population in 202—meaning that everyone uses the internet in the KSA. Finally, Table 2 shows a low standard error across the demographic variables which indicates that the sample means are closely distributed around the population mean – thus, it is more likely that our sample is representative of the larger population we were trying to reach.

## Analysis

After the data collection and cleaning procedure, we were left with 242 valid female responses, which we then analyzed using Stata (Table 3 shows descriptive information). First, we calculated the mean score for each variable to eliminate variables with a mean value less than 3, which corresponds to ‘it does not matter,’ ‘disagree,’ or ‘strongly disagree.’ Then, we determined the reliability of the responses and the suitability of factor analysis. The result shows Cronbach’s Alpha value of 0.830, which indicates good reliability of the responses. The result of the Kaiser-Meyer-Olkin (KMO) test is 0.808, which indicates that the sampling is adequate and factor analysis is appropriate to conduct for these items (Yung *et al.*, 2017; Jian *et al.*, 2020).

Next, we conducted EFA to categorize the measurement items into fewer, more meaningful factors (Yung *et al.*, 2017). EFA provides insight into how these items manifest themselves in each construct factor and eliminates nonrepresentative items. After conducting EFA with factor rotation, we removed items with factor loading below

**Table 2.** Descriptive table.

	Total Female Respondents	
	Mean or %	SE
Age	40	0.78
Saudi	0.98	0.01
Married	0.70	0.03
Have Children	0.69	0.03
Own a Car	0.41	0.03
Income		0.10
• Less than 3500Rs	23.5%	-
• 3500–8699Rs	18.2%	-
• 8700–11999Rs	20.7%	-
• 12000–15299Rs	16.5%	-
• 15300–20159Rs	12.4%	-
• 20170Rs and more	8.7%	-
Education		0.04
• General education	4.1%	-
• High school graduate	15.7%	-
• College graduate	65.3%	-
• High education	14.9%	-
Residence Status		0.06
• Single-family house	68.2%	-
• Duplex	7.4%	-
• Apartment/single floor	24.4%	-
N	242	

0.4, a commonly-suggested cutoff for factor loadings (Howard, 2016). From the 28 items, 4 were eliminated, leaving 24 items as representative to the index. We categorized these items into six meaningful factors. We list all factor loadings, percentage of variance explained, and cumulative percentage of the variance in Table 3.

Although EFA categorized items into factors assumed to form the spatial attributes that influence women's rights to public space, it does not identify the weight and importance of these items and factors. Therefore, we used FSE as an evaluation tool and to help build composite indicators for an assessment index (Haider *et al.*, 2018; Jian *et al.*, 2020). For this study, we adopted the FSE procedure by Jian *et al.* (2020, p. 6). The weightings and the membership functions of the 24 items and 6 factors are computed and presented in Table 4. The result of the factor index and relative explanatory power of the six factors are presented in Table 5.

## Design and management measures

### Orientation and access

A number of studies have highlighted the importance of physical and visual orientation and connectivity to, and within, a public space as a critical factor shaping overall publicness (e.g. Whyte, 1980; Varna & Tiesdell, 2010). In general, places are more exclusive when they are hidden and isolated from adjacent areas and/or when they are difficult to navigate (Lynch, 1960; Varna, 2016). Factor 1 'orientation and access' thus accounts for 12.12% of the total variance in the factor analysis. This factor deals mainly with physical and locational features and contains four variables.

First, the positioning of entrances should be easy and straightforward (Valentine, 1990). This item obtained the highest factor loading of 0.836 and a mean value of 4.59. Second,

**Table 3.** EFA results.

Rank	Design and management factors contributing to women's rights access and use to public space	Mean	Factor loading (in descending order)	% of variance explained	Cumulative % of variance
	<b>Factor 1: Orientation and access</b>			12.120	12.120
7	The positioning of entrances should be easy and straightforward such that women do not have to walk down passageways to gain access to site	4.59	0.836		
6	The parking lot should be located very close to the site	4.60	0.786		
5	Design walkways and sidewalks so that it has easy movement, avoid digging, and avoid damaged floor	4.61	0.777		
9	Putting transparent glass at the entrances to elevators, stairs and shops, to facilitate viewing through them before entering	4.47	0.700		
	<b>Factor 2: Civility and security</b>			11.520	23.650
3	Physical maintenance and cleansing regime of hard and soft landscaped areas and street furniture	4.77	0.891		
1	Public restrooms should be well maintained and clean	4.81	0.889		
4	Presence of security personal	4.76	0.729		
2	Presence of security cameras	4.81	0.721		
	<b>Factor 3: Privacy and isolation</b>			11.360	35.000
17	Having only women (families) public space	3.81	0.804		
22	Divide the time to have times for women (families) only and times for single men only	3.12	0.791		
19	Public space should include spaces where you can have some privacy (e.g. sittings areas with some partitioning)	3.72	0.743		
23	The presence of single men makes the space dangerous	3.06	0.714		
21	Public space should be fenced	3.15	0.585		
	<b>Factor 4: Form and appearance</b>			10.100	45.100
12	Isolated or invisible spaces reduce comfort and safety	4.18	0.754		
15	Enclosed spaces with limited exits and limited visibility reduce comfort and safety	3.90	0.724		
20	Avoid having underground or multi-story car parks (garages)	3.60	0.615		
8	Dark, deserted buildings or vacant land on the site reduce comfort and safety	4.59	0.520		
24	Very large areas reduce comfort and safety	3.02	0.487		
11	Walls painted white, especially in dark areas to improve visibility and make the space appear more open	4.27	0.447		
	<b>Factor 5: Vitality and animation</b>			8.150	53.250
10	Offering a diverse range of activities	4.29	0.821		
14	Street vendors provide light and crowd which give a sense of comfort	4.01	0.817		
16	Having a large number of people makes the place safer	3.88	0.611		
	<b>Factor 6: Arrangement and lighting</b>			5.720	58.980
18	Bright light to encourage use at night	3.78	0.823		
13	Trees should be arranged so they do not block visual access, physical access, and lightings	4.09	0.698		
	KMO TEST		0.808		
	CRONBACH'S ALPHA		0.830		
	Total number of respondents		242		

parking areas should be located very close to the site (Valentine, 1990; Kallus & Churchman, 2004; Viswanath & Mehrotra, 2007). This item is important particularly in car-dependent cities such as Riyadh. Hence, participants, on average, strongly agreed on the importance of this item with a mean value of 4.60 and factor loading of 0.786. Third, walkways and sidewalks should be designed and maintained to allow for unimpeded and comfortable mobility. Pavement must be in a good condition and clear of obstacles, so women have easy movement to escape in case of danger (Viswanath & Mehrotra, 2007). Thus, this item



**Table 4.** Weightings and membership functions of all variables and factors.

Rank	Design and management factors contributing to women's rights to access and use public space	Weightings	Membership functions of Level 2 (Variables)	Membership function of Level 1 (Factors)
	<b>Factor 1: Orientation and access</b>	0.187		(0.000, 0.013, 0.039, 0.342, 0.617)
7	The positioning of entrances should be easy and straightforward such that women do not have to walk down passageways to gain access to site	0.251	(0.000, 0.012, 0.021, 0.331, 0.636)	
6	The parking lot should be located very close to the site	0.252	(0.000, 0.000, 0.029, 0.343, 0.628)	
5	Design walkways and sidewalks so that it has easy movement, avoid digging, and avoid damaged floor	0.252	(0.000, 0.000, 0.017, 0.360, 0.624)	
9	Putting transparent glass at the entrances to elevators, stairs, and shops, to facilitate viewing through them before entering	0.245	(0.000, 0.041, 0.091, 0.335, 0.570)	
	<b>Factor 2: Civility and security</b>	0.196		(0.000, 0.007, 0.015, 0.158, 0.819)
3	Physical maintenance and cleansing regime of hard and soft landscaped areas and street furniture	0.249	(0.000, 0.012, 0.008, 0.174, 0.806)	
1	Public restroom should be well maintained and clean	0.251	(0.000, 0.012, 0.012, 0.124, 0.851)	
4	Presence of security personal	0.249	(0.000, 0.000, 0.025, 0.186, 0.789)	
2	Presence of security cameras	0.251	(0.000, 0.004, 0.017, 0.149, 0.831)	
	<b>Factor 3: Privacy and isolation</b>	0.172		(0.045, 0.219, 0.216, 0.273, 0.233)
17	Having only women (families) public space	0.226	(0.029, 0.136, 0.161, 0.339, 0.335)	
22	Divide the time to have times for women (families) only and times for single men only	0.185	(0.079, 0.289, 0.260, 0.178, 0.194)	
19	Public space should include spaces where you can have some privacy (e.g. sittings areas with some partitioning)	0.221	(0.007, 0.112, 0.161, 0.355, 0.306)	
23	The presence of single men makes the space dangerous	0.181	(0.033, 0.314, 0.306, 0.252, 0.095)	
21	Public space should be fenced	0.187	(0.087, 0.285, 0.219, 0.211, 0.198)	
	<b>Factor 4: Form and appearance</b>	0.241		(0.011, 0.101, 0.209, 0.372, 0.373)
12	Isolated or invisible spaces reduce comfort and safety	0.177	(0.000, 0.033, 0.099, 0.525, 0.343)	
15	Enclosed spaces with limited exits and limited visibility reduce comfort and safety	0.166	(0.000, 0.120, 0.136, 0.463, 0.281)	

(Continued)



**Table 4.** (Continued).

Rank	Design and management factors contributing to women's rights to access and use public space	Weightings	Membership functions of Level 2 (Variables)	Membership function of Level 1 (Factors)
20	Avoid having underground or multi-story car parks (garages)	0.153	(0.050, 0.124, 0.285, 0.256, 0.285)	
8	Dark, deserted buildings or vacant land on the site reduce comfort and safety	0.195	(0.000, 0.000, 0.037, 0.335, 0.628)	
24	Very large areas reduce comfort and safety	0.128	(0.029, 0.413, 0.207, 0.207, 0.145)	
11	Walls painted white, especially in dark areas to improve visibility and make the space appear more open	0.181	(0.000, 0.017, 0.145, 0.393, 0.446)	
	<b>Factor 5: Vitality and animation</b>	0.124		(0.010, 0.076, 0.153, 0.363, 0.399)
10	Offering a diverse range of activities	0.352	(0.012, 0.008, 0.141, 0.360, 0.480)	
14	Street vendors provide light and crowd which give a sense of comfort	0.329	(0.017, 0.079, 0.186, 0.318, 0.401)	
16	Having a large number of people makes the place safer	0.319	(0.000, 0.149, 0.132, 0.413, 0.306)	
	<b>Factor 6: Arrangement and lighting</b>	0.080		(0.002, 0.093, 0.094, 0.586, 0.225)
18	Bright light to encourage use at night	0.480	0.004, 0.136, 0.120, 0.558, 0.182)	
13	Trees should be arranged so they do not block visual access, physical access, and lightings	0.520	(0.000, 0.054, 0.070, 0.612, 0.265)	

**Table 5.** Indices and importance levels for all factors.

Factors	Index	Normalized index	Importance level	Ranking
Factor 1: Orientation and access	4.60	0.14	Very important	2
Factor 2: Civility and security	4.79	0.19	Very important	1
Factor 3: Privacy and isolation	3.39	0.20	It does not matter	6
Factor 4: Form and appearance	4.19	0.14	Important	3
Factor 5: Vitality and animation	4.07	0.17	Important	4
Factor 6: Arrangement and lighting	3.94	0.16	Important	5

The importance levels are determined in response to the factor index with cutoffs as follows: 3<'it does not matter'< 3.5, 3.5=<'important'<4.5, 4.5=<'very important'.

got the highest mean value (4.61) within Factor 1, and factor loading of 0.777. Fourth, doorways of shops, elevators, and stairs should be transparent. Women tend to prefer to see through doorways before entering in order to avoid perceptions of danger (Valentine, 1990). Although this item obtained the lowest mean value (4.47) and factor loading (0.700) in this factor, it still retains relative import in the analysis.

### **Civility and security**

Factor 2, 'Civility and security' is ranked first in the index and rated as very important. It accounts for 11.52% of the total variance in the factor analysis. This factor deals mainly with managerial features and contains four items. The first two items fall within the category of civility, which generally refers to the degree of comfort and accommodation in public space. Many studies have signified the importance of civility as a strategic approach that influences the degree of overall publicness of public space (Varna & Tiesdell, 2010; Ekdi & Çıracı, 2015). Madanipour (2004) identified the importance of cleanliness and tidiness to the overall positive image of a public environment. Therefore, the first item signifies the importance of physical maintenance of hard and soft landscaped areas and street furniture (Kallus & Churchman, 2004; Viswanath & Mehrotra, 2007). Maintenance is critical since it can reduce fear and misbehavior (Kallus & Churchman, 2004). Thus, this item obtained the highest factor loading of 0.891 and a mean value of 4.77. The second item expresses the importance of the maintenance and cleanliness of public restrooms. Mahadevia and Lathia (2019) found that women avoid using public restrooms in poor neighborhoods because they are often in 'a filthy and vandalized state' (p. 157). As such, this item has the highest mean value (4.81) in the index and factor loading of 0.889.

The second two items fall within the category of security. Although security in public space is sometimes viewed as a tool of exclusion (Valentine, 1990; Mitchell, 2003), it is also an essential part of making spaces feel safer, especially when visual access is limited (Trench *et al.*, 1992; Viswanath & Mehrotra, 2007; Mahadevia & Lathia, 2019). Thus, the third item recommends the presence and visibility of security personnel and security stations. Although this item recorded the lowest mean value (4.76) with a factor loading of 0.729 in Factor 2, it is still considered very important. The last item suggests the presence of security cameras, particularly in spaces with limited visual range. Although this item obtained the lowest factor loading of 0.721 in Factor 2, it ranked second in the index with a mean value of 4.81. Again, security in public places is not always negative and is often a desirable factor to increase perceptions of personal safety, especially for women or other vulnerable populations (Jackson, 1998). Nevertheless, making security a priority dimension in designing and operating public places can also create a negative impact on the core concept of public space as an inclusive space (Warren, 2002; Mitchell, 2003; Marcuse, 2006; Nemeth & Hollander, 2010; Roberts, 2012). Thus, it is critical to seek a balance between the publicness of public space and personal security, and determine ways in which security can be effective without being exclusionary.

### **Privacy and isolation**

Several studies in the KSA have emphasized the importance of maintaining personal privacy in public space, particularly for women (Abu-Gaueh, 1995; Bahammam, 1995; Al-Hussayen, 1996; Al-Abdullah, 1999). The importance of privacy is rooted in Islamic values, as the Holy Qur'an instructs men to respect women's visual privacy by preventing gazing upon non-relative women (Qur'an, Surat An-Nur, 30).<sup>5</sup> This is also manifested in real life, as Abu-Gaueh (1995) found that women in the KSA preserve their personal privacy by maintaining 'as much distance as they can from any unaccompanied,

unrelated males' (p. 99). Bahammam (1995) also argues that outdoor recreation places in the KSA often fail to create a comfortable space for women because they lack consideration of the social-cultural aspect of privacy. Although these studies have emphasized the importance of privacy, Factor 3, 'Privacy and isolation' is ranked as the least important factor with an index factor of 3.39. This may be due to the current social reforms that have reduced the importance of the social-cultural aspect of privacy.

Factor 3 contains five items. The first relates to the inclusion of women- or family-only spaces in the city. This item obtained the highest mean value (3.81) in Factor 3, and factor loading of 0.804. This item suggests that women in the KSA restrict their activities in public spaces when there are single-male groups near them (Al-Abdullah, 1999; Mustafa, 2015; Almahmood *et al.*, 2017). Notably, this argument does not comport with items 2 and 4, both of which have mean values close to neutral. A possible explanation is that some women in Riyadh prefer to reserve some gender-exclusive space in the city where they can feel more empowered and comfortable. For instance, Le Renard (2011) found that female university campuses are known to be places where women freely uncover their *abayas*<sup>6</sup> and display their femininity. Therefore, in the context of this study, having some gender-exclusive bonding spaces in the city might empower women's spatial practices. Still, this does not mean all public places in the city should exclude men or divide the operation times to serve one gender at a time.

The third item recommends that public space should include spaces that afford some privacy (e.g. sittings areas with partitioning). Previous studies have highlighted that women in the KSA do not feel comfortable in public places where they cannot protect their visual privacy because they will find themselves covering their faces at all times (Bahammam, 1995; Almahmood *et al.*, 2018).<sup>7</sup> Hence, this item obtained the second highest mean value (3.72) in Factor 3, and a factor loading of 0.743. The last item suggests that public space should be fenced. This item is less important to the women surveyed, with a mean value close to neutral (3.15) and a factor loading of 0.585.

### **Form and appearance**

The design and the layout of the physical environment can influence women's feelings of safety and perceptions of fear, thus limiting their access to, and use of, public space (Wilson, 1992; Day, 1999a; Pain, 2001; Fenster, 2005; Roberts, 2009; Whitzman, 2013; Sur, 2014). Therefore, Factor 4, 'form and appearance,' is ranked third in the index and considered an important factor. It accounts for 10.1% of the total variance in the analysis. This factor deals mainly with physical features and contains six items.

First, isolated or invisible spaces can reduce comfort and safety (Valentine, 1990; Kallus & Churchman, 2004; Viswanath & Mehrotra, 2007). In their study of public spaces in Canada and Israel, Kallus and Churchman (2004) found that women's lack of safety in public space can intensify in deserted spaces such as isolated bus stops and public restrooms. Hence, this item obtained the highest factor loading of 0.754 in Factor 4 and a mean value of 4.18. Second, enclosed spaces with limited exits and limited visibility reduce comfort and safety (Valentine, 1990; Loukaitou-Sideris & Fink, 2009a; Sur, 2014). Valentine (1990) argues that enclosed spaces such as underground passages and stairways suggest an uncontrolled environment where women can be subjected to real or perceived dangers. This item has a mean score of 3.90 and factor loading of 0.724.

The third item recommends avoiding underground or multi-story garages (Valentine, 1990; Trench *et al.*, 1992; Viswanath & Mehrotra, 2007). Valentine (1990) found that women avoid parking in garages because they feel unsafe, especially in underutilized garages. Given the high demand of parking spots in Riyadh's public spaces since it is an eminently car-dependent city, participants on average agreed on the importance of this item with a mean value of 3.60 and factor loading of 0.615. The fourth item suggests that dark, deserted buildings or vacant land on the site reduce comfort and safety (Kallus & Churchman, 2004; Loukaitou-Sideris & Fink, 2009a). Criminologists have shown evidence that visible signs of an abandoned environment, such as deserted buildings and vacant land, cause more anti-social behavior and the perception of disorder and more serious crime than that which actually exist (Wilson & Kelling, 1982). Moreover, women tend to be more sensitive than men in perceiving such risky environments (Wekerle & Whitzman, 1995; Smith & Torstensson, 1997). Therefore, this item is considered the most important variable in Factor 4 with the highest mean value (4.59) and a factor loading of 0.520.

The fifth item considers that very large areas reduce comfort and safety. Although previous evidence claims that women feel vulnerable in large open areas because such areas are often uninhabited and lack natural surveillance (Valentine, 1990), this item as the least important in the index with the lowest mean value (3.02) and a factor loading of 0.487. One possible explanation is that large areas offer opportunities for some privacy, which, as was explained in Factor 3, seems to be more important for women in the KSA. The final item suggests that walls should be painted white, especially in dark areas, to improve visibility and make spaces appear more open. Many studies have associated danger for women with dark spaces (Valentine, 1990; Sur, 2014; Mahadevia & Lathia, 2019). As such, Valentine (1990) recommends that walls in dark areas, such as parking garages, be painted in white to increase visibility. This item has a mean score of 4.27 and factor loading of 0.447.

### **Vitality and animation**

Animation refers to the opportunities a place offers for human needs (Varna, 2016). Vibrant public places that offer a diversity of uses and activities tend to be more welcoming (Jacobs, 1961; Gehl, 2006, 2013; Whyte, 1980; Franck & Paxson, 1989). Factor 5 deals with vitality and animation and is ranked fourth in the index and is a relatively important factor with a total variance of 8.15% in the factor analysis. This factor contains three items. First, public space should offer a diverse range of activities. Mahadevia and Lathia (2019) found that public places with more diverse activities and uses can increase the number of users and consequently increase women's sense of safety and belonging in public space. Thus, this item attained the highest mean value (4.29) in Factor 5 with a factor loading of 0.821. Second, street vendors can draw crowds, which give a sense of comfort for women. Studies in India found that the presence of street vendors increases natural surveillance (i.e. 'eyes on the street'), which offered a sense of safety and comfort for women, even at night (Viswanath & Mehrotra, 2007; Mahadevia & Lathia, 2019). Our study participants, on average, agreed on the importance of this item with a mean value of 4.01 and factor loading of 0.817. The final item relates to the presence and visibility of others on women's sense of safety and comfort (Valentine,

1990; Mahadevia & Lathia, 2019). Mahadevia and Lathia (2019) found that women avoid using public space at night unless it is crowded, which is purported to make women feel safer in public space. This item has a mean score of 3.88 and a factor loading of 0.611.

### **Arrangement and lighting**

Factor 6, 'Arrangement and lighting,' is ranked fifth in the index and considered an important factor. It accounts for 5.72% of the total variance in the factor analysis and contains only two items. First, bright light encourages the use of space at night, highlighting the issue of women's safety and feeling of danger in public space at night (e.g. Trench *et al.*, 1992; Day, 2000; Loukaitou-Sideris & Fink, 2009a; Sur, 2014). Using bright light in public space at night can increase visibility and significantly improve the perception of safety for women (Valentine, 1990; Kallus & Churchman, 2004; Viswanath & Mehrotra, 2007; Mahadevia & Lathia, 2019). Accordingly, this item has a mean score of 3.78 and factor loading of 0.823. The second item suggests that trees should be arranged so they do not block visual access, physical access, or lighting. Overgrown trees and trees planted near pathways are found to increase fear of violence, especially for women, because they block lights, visibility, and movement (Valentine, 1990; Viswanath & Mehrotra, 2007). Our index corroborates this assertion, and this variable has mean score of 4.09 and factor loading of 0.698.

### **Discussion**

The Women-friendly Public Space Index is a response to the fact that women, compared to men, do not experience the same freedoms in accessing and using public space (Boys, 1984; Franck & Paxson, 1989; Day, 1999b; Kallus & Churchman, 2004). The main goal of the index is to make it simpler for decision-makers to understand women's needs in public space and alert key stakeholders to these critical concerns during the public space design process. It provides researchers a tool to examine the important connection between the built environment and the subsequent freedom of women in urban spaces.

It is important to note that this index will not completely resolve the rights to access and use public space for all women. Women's use, behavior, and perception in public places differ due to age, class, race, and education (e.g. Day, 1999a; Koskela & Pain, 2000), citizenship or immigration status (e.g. Ortiz *et al.*, 2004), cultural and religious background (e.g. Gholamhosseini *et al.*, 2019), and geographic location (e.g. Day, 1999a; Kallus & Churchman, 2004). Indeed, women-friendly public space cannot be produced using basic mathematical formulas alone. Instead, such processes require in-depth examinations using various frameworks and involving a diverse set of stakeholders (Koskela & Pain, 2000). This index thus serves as a starting point for deeper analyses in the KSA and, potentially, further afield.

The index is focused particularly on aspects of safety and comfort for women in public space, which might limit the various experiences that public space can offer. This limitation is not found in this index only, but also in the current scholarly discourse. Scholars frequently conceptualize women's experiences in public space as fearful or precarious (Wilson, 1992; Day, 1999a; Pain, 2001; Fenster, 2005; Roberts, 2009; Whitzman, 2013; Sur, 2014). Although fear is an instrumental aspect that

restricts women from using public space, other unexplored aspects tend to affect women's rights to public space. For instance, women's preference for privately owned public spaces such as shopping malls due to perceptions of increased safety and comfort has long been discussed in the literature (Day, 1999b; Viswanath & Mehrotra, 2007; Sur, 2014). Therefore, focusing only on women's safety and comfort measures might conflict with other experiential qualities present in public space (e.g. spatial discovery, expression, and social interaction) that might shape women's broader satisfaction in public space.

Nonetheless, this index presents an initial attempt toward analyzing such a challenge and allows for more robust and rigorous assessments than many existing efforts. It can also help uncover more appropriate design and management strategies that facilitate women's rights to access and use public space in the KSA and other contexts.

## Conclusion and future research

The emergence of the recent gender-inclusive public spaces in the KSA provides new opportunities for men and women to be present together and, ideally, engender social learning and empathy. Nonetheless, we do not anticipate that the current KSA's social reform will abolish the limitations women may face in public spaces on its own after decades of gender segregation in KSA. Regardless, we believe that the current reform has begun to encourage the reformation of public space to promote a more just and equitable urban life for women.

In this paper, we proposed a robust design and management index of women-friendly public space. We conducted our inspection by relying on relevant literature and survey responses from a sample of women in the KSA. Through EFA and FSE procedures, we ended up with 24 items and six factors that influence women's access to, and use of, public space. Then, we discussed each factor by relating them back to the dominant literature on the subject. The proposed index helps to link theoretical notions of women-friendly public space with empirical factors shaping inclusion and exclusion in public space.

This index provides insights for public space research and practice and opens the door for further investigation. First, although the items included in this index were extracted from empirical studies conducted in different contexts, evaluation relied on survey responses from women who live in Riyadh only. Because women's use, behavior, and perceptions in public places vary due to demographic and contextual factors, we cannot claim that this index is a one-size-fits-all solution. Although we recognize that the result of the index must be contextually-relevant, we believe the index offers a methodological procedure that could be replicated in different contexts.

Second, the index is restricted to women's safety and comfort in public spaces, limiting the range of experiences that public spaces can provide. If safety and comfort measures are the primary, or only, factors considered, we might downplay the import of other factors shaping women's experiences of public spaces. In light of this, future studies should examine additional experiential attributes such as spatial discovery, expression, and social interaction.

## Notes

1. Although we recognize that gender is socially-constructed idea that is not limited to binary categories, we use the term gender in this paper as the social identities of two biological sexes.
2. The feminist movement waves include: 1) women's suffrage movements in the 19th and early-20th centuries; 2) women's liberation movement that began in the 1960s; 3) Third-wave-feminism that began around 1992 and focused on individuality and diversity; 4) Fourth-wave-feminism/MeToo-Movement that began around 2012, battling gender-based harassment, violence against women, and rape culture by using social media and the internet as a platform.
3. *Al-Sahwa* is an Islamic revival began during the late 1960s which spread a conservative version of Islam across Muslim communities worldwide and mainly in KSA. Nowadays, *Al-Sahwa* is criticized by the government of KSA, many Saudis, and even some of Saudi's Islamic theologians.
4. A joint initiative by UN-Habitat and Global Utmaning launched on 8 March 2021.
5. Relatives (*arhaam*) in Islam include (parents, children, siblings, uncles, aunts, grandparents, grandchildren, nieces, and nephews).
6. An *abaya* is a wrap or cloak worn by women to cover their body and it is usually black.
7. Some women wear *Niqab*, similar to *Hijab*, which covers the head as well as the face except for the eyes. *Niqab* is mostly worn by Saudi women but is also worn by some Muslim women in other countries.

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