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EDITED BY
Yosef Jabareen,
Technion Israel Institute of Technology, Israel

REVIEWED BY
Nihaya A. Al-sheyab,
Jordan University of Science and Technology, Jordan
Simon Bell,
University of Edinburgh, United Kingdom
Linchuan Yang,
Southwest Jiaotong University, China

*CORRESPONDENCE
Mohammed Z. Allouh
m_allouh@uaeu.ac.ae

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The perceived built environment and general physical activity: An exploratory study in Jordan

Rami Saadeh[1], Ahmed Obaidat[2] and Mohammed Z. Allouh[3]*

[1]Department of Public Health, Faculty of Medicine, Jordan University of Science and Technology, Irbid, Jordan, [2]Ministry of Health, Amman, Jordan, [3]Department of Anatomy, College of Medicine and Health Sciences, United Arab Emirates University, Al-Ain, United Arab Emirates

Introduction: The built environment affects the health and wellbeing of the population. The main purpose of this study was to explore the association between the perceived built environment and general physical activity among Jordanians.

Methods: This cross-sectional study was conducted in Jordan between August and November of 2019 using an online self-administered questionnaire distributed to Facebook groups that are commonly used among the Jordanian population. Descriptive statistics using chi-square test of independence was used to examine the relationship between demographic information and the perceived built environment with physical activity.

Results and discussion: A total of 1,124 participants were involved in the study with the majority being middle-aged (91.5%), females (67.7%), undergraduates (68.1%), and living in urban areas (71.2%). Most study participants (68.2%) were neither physically active 'at least two times per week' nor using parks for routine physical activity (82.5%). Regarding the association of demographic information with physical activity, gender was significantly associated with weekly physical activity, whereas age and monthly income were significantly associated with routine walking or biking. Further, on the one hand, gender, residency, and monthly income were significantly associated with physical activity at the park ($p \leq 0.05$). On the other hand, the availability of specific biking paths, having good and accessible places for physical activity, was among the built environment factors that were significantly associated with weekly physical activity ($p \leq 0.05$). Some characteristics of the perceived built environment were associated with physical activity. Therefore, enhancing the built environment is considered a cornerstone in any national health behavior plan that includes physical activity as one of its components.

KEYWORDS

physical activity, built environment, adults, Jordan, perception

Introduction

The built environment is broadly defined as the space made by humans where people live and react with each other to work or recreate daily. It includes any change in the environment over or under the ground such as creating or modifying buildings or spaces (Sallis et al., 2012). It can directly affect the health of people through exposure to certain

pollutants or toxins, for example, lead leaked from water pipes or pesticides floating in air (Perdue et al., 2003). Besides, the built environment can indirectly affect people's health through the behaviors of people that are affected by the structure and design of the built environment. The lack of well-built roads, parks, and specific playgrounds may reduce the level of physical activity of people, thus, adversely affecting their health (Perdue et al., 2003; Sallis et al., 2012). In Jordan, most roads are narrow and treacherous and sidewalks are not well-maintained, resulting in high traffic, crowding, and high incidence of accidents, especially in major cities and areas with condensed communities (Reports, 2022). In addition, there is a huge lack of public parks, playgrounds, and served facilities that could be used for physical activity. The Ministry of Health recommends in general, without any age specification, 30 min of moderate physical activity like walking 5 days per week, or 20 min of vigorous physical activity like running 3 days per week (Jordan Ministry of Health, 2020). However, studies in Jordan revealed that a large portion of different ages in the community do not practice an adequate level of physical exercise (World Health Organization and Regional Office for the Eastern Mediterranean, 2015; Al-Sagarat and Al Kalaldeh, 2017).

There are no published studies in Jordan that estimated the effects of built environment on the levels of physical activity in Jordan, but there is significant evidence that the built environment can influence the level of physical activity through which an improved built environment leads to higher levels of physical activity among residential communities (Smith et al., 2017). For example, a study in China showed that residential density, street connectivity, and accessibility to the physical environment were significantly correlated with physical activity in Dalian city (Sun et al., 2019); and among children of England, physical activity was positively associated with perceptions about the built environment, where neighborhoods with good paths for walking or biking, adequate parks, and accessible physical environment increased the levels of physical activity, especially among boys (Duncan et al., 2012). Besides, demographic characteristics of residents were associated with physical activity based on their perception of the built environment surrounding them. For instance, in the United States, the perception of crime was significantly associated with physical activity in the parks of Los Angeles city, where women were less active than men because they concern about personal safety in such parks (Derose et al., 2019), and people with a higher income were more physically active than people with lower income in Nanjing city, China (Wu et al., 2019).

Although the relationship between built environment and physical activity is noticeable, studies in this regard are lacking in the region. Hence, the aim of this study was to explore the relationship between the perceived built environment and general physical activity among adults living in Jordan in addition to examining the link between the demographic information of participants and physical activity to explore whether the demographic information plays a role. Findings could help in the detection of barriers to practicing physical activity related to the built environment and shall guide health programs and national policies to consider this relationship in long-term planning.

Materials and methods

Study design and settings

The current study incorporated a cross-sectional design that used an online questionnaire distributed to Facebook groups to estimate the relationship between the perceived built environment and physical activity among adults living in Jordan between August, 2019, and November, 2019. The selected Facebook groups were those commonly used among the Jordanian population and are known to include a variety of topics for discussion. Online data collection proved to be a cheaper and faster way to collect data and provided higher privacy for participants.

Study population

The estimated population of Jordan based on the United Nations data was 10,048,577 individuals as of May 2019 (Worldometers, 2019). By using Epi-Info seven sample calculator, a sample size of 1,067 individuals were needed for a 95% confidence interval and a 3% margin of error.

The sample pool included public Facebook groups that discuss common issues in Jordan and more specific Facebook groups that have a common interest such as groups of public universities in Jordan, groups of some professions and specialties, and other community groups. The size of these groups is not known, as some have an inactive membership, while others could have more than one username, in addition to those who should be excluded from the study, like those who did not live in Jordan at the time of the survey. To exclude those who do not live in Jordan, a small note was made in the preface of the survey indicating the necessity of living in Jordan to participate in the study, in addition to the first question which asked about the place of residence.

Study instrument

The study questionnaire was developed based on previous studies (Perdue et al., 2003; Duncan et al., 2012; Sallis et al., 2012; Smith et al., 2017; Guddal et al., 2019), and it is composed of an interface and three main parts reaching a total of 17 questions. The interface of the questionnaire explains the mechanism and the aims of the study in addition to the consent for participation.

The main parts of the questionnaire contained seven questions related to the socio-demographic characteristics of participants, seven questions related to the knowledge of participants about the perceived built environment, and three questions related to physical activity–related practices.

After the validation process, the questionnaire was formatted into Google forms, which is an internet-based software commonly used for data collection. This software was chosen because of its convenience, efficiency, and increased popularity. After the entry of the questionnaire into Google forms, a link that direct to the online questionnaire was randomly distributed to the selected Facebook groups.

Ethical approval

The study protocol was approved by the Institutional Review Board (IRB) of Jordan University of Science and Technology (JUST). Participation consent was secured from every study participant. Data collection forms did not contain any item that could refer to the identity of participants. Data generated from this study were used for research purposes only and were treated confidentially during the entire process of the research.

Data collection

The questionnaire of the study was distributed to common Facebook groups and more specific ones that are widely used among the Jordanian population. Members of those Facebook groups who clicked the posted link of the questionnaire were directed to the Google forms. The preface of the questionnaire contained the consent form with the right to withdraw at any time, the objectives of the study including an operational statement of physical activity as any form of sport or exercise that the participant practices, and the necessity to live in Jordan to proceed with the form. To prevent missing data, all items in the online questionnaire should be filled or the participant could not proceed to the next page; a notification box appears warning the participant that one or more items were not answered.

Statistical analysis

Data retrieved from the online questionnaire were entered into Microsoft Excel and then imported into the Statistical Package for the Social Sciences (SPSS) version 25 for analysis. Descriptive statistics were used to describe the target population, knowledge of the perceived built environment, and physical activity–related practices among the study participants. Chi-square test of independence was used to examine the relationship between demographic variables and the perceived built environment with physical activity–related practices. A p-value of 0.05 or less was considered statistically significant.

Study variables

Independent variables

The study involved seven independent variables about socio-demographic characteristics of the study participants and seven independent variables of knowledge about the perceived built environment.

The socio-demographic variables included age, gender, region, residency, education, occupation, and monthly income. Age was categorized into four groups (<18, 18–40, 41–60, and >60). Gender was classified into males and females. Region variable was created by converting the twelve governorates into three regions (North, Center, and South). Residency included two groups of people who were living in urban or rural areas. Education was categorized into three groups that involved people with high school education or lower, college or university degree, and postgraduate degree. Occupation groups were unemployment, private work, field work, and office work. Monthly income was classified into people with income <500 JD, 500–1,000 JD, and more than 1,000 JD.

Variables of knowledge about the perceived built environment included status of sidewalks, presence of specific paths for biking, spaces between buildings, presence of enough places for physical activity, number of physical activity places, status of physical activity places, and accessibility to physical activity places. Status of sidewalks was classified into no sidewalks, good sidewalks, and bad sidewalks. Presence of specific paths for biking and presence of enough places for physical activity were dichotomous questions with yes or no answers. The question about spaces between buildings was categorized into crowded and not crowded. Number of physical activity places included three categories (no places, 1–2, and >2), and it was created by converting the question about the available recreational facilities that enhance physical activity which had seven items and allowed multiple selection (no places, parks with playgrounds, fitness gym, swimming pool, green spaces, tennis playgrounds, and football playgrounds). Status of physical activity places was classified into no places, good, and not good. Accessibility to places of physical activity was categorized into accessible and not accessible.

Dependent variables

The study involved three dependent variables about physical activity–related practices. Variables about physical activity practices included physical activity "at least two times per week" (except for walking), "walking or biking routinely at least 10–15 minutes to reach or return from places", and "physical activity

TABLE 1 Distribution of socio-demographic variables by physical activity at least 2 times per week ($N = 1,124$).

Variable	Category	Physical activity at least two times per week (except for walking)			*p*-value
		Yes (%)	No (%)	Total (%)	
Age	≤40	337 (32.2)	709 (67.8)	1,046 (100.0)	0.258
	>40	20 (25.6)	58 (74.4)	78 (100.0)	
	Total	357 (31.8)	767 (68.2)	1,124 (100.0)	
Gender	Male	140 (38.6)	223 (61.4)	363 (100.0)	0.001
	Female	217 (28.5)	544 (71.5)	761 (100.0)	
	Total	357 (31.8)	767 (68.2)	1,124 (100.0)	
Region	North	195 (31.3)	429 (68.8)	624 (100.0)	0.909
	Center	146 (32.3)	306 (67.7)	452 (100.0)	
	South	16 (33.3)	32 (66.7)	48 (100.0)	
	Total	357 (31.8)	767 (68.2)	1,124 (100.0)	
Residency	Urban	252 (31.5)	548 (68.5)	800 (100.0)	0.767
	Rural	105 (32.4)	219 (67.6)	324 (100.0)	
	Total	357 (31.8)	767 (68.2)	1,124 (100.0)	
Education	Up to high school	25 (36.8)	43 (63.2)	68 (100.0)	0.657
	Undergraduate	240 (31.4)	525 (68.6)	765 (100.0)	
	Postgraduate	92 (31.6)	199 (68.4)	291 (100.0)	
	Total	357 (31.8)	767 (68.2)	1,124 (100.0)	
Occupation	Unemployed	215 (31.6)	466 (68.4)	681 (100.0)	0.865
	Employed	142 (32.1)	301 (67.9)	443 (100.0)	
	Total	357 (31.8)	767 (68.2)	1,124 (100.0)	
Monthly income	<500 JD	109 (29.5)	261 (70.5)	370 (100.0)	0.384
	500–1,000 JD	169 (33.8)	331 (66.2)	500 (100.0)	
	>1,000 JD	79 (31.1)	175 (68.9)	254 (100.0)	
	Total	357 (31.8)	767 (68.2)	1,124 (100.0)	

at the park". All the questions about physical activity–related practices were dichotomous with yes or no answers.

Validity and reliability

Validity

The questionnaire was initially developed in English language and reviewed for face and content validity by public health experts. After that, the questionnaire was translated into Arabic language and reviewed again by the experts to check for consistency between the Arabic and English questionnaires. The Arabic questionnaire was back-translated by another language expert into English to validate the accuracy and proficiency of the translated version of the questionnaire.

Reliability

A pilot study randomly included 50 persons to complete the Arabic questionnaire to identify the challenges in questionnaire completion, ambiguous terms, and time needed to complete the questionnaire. The participants of the pilot study were not included in the analysis.

Results

This study enrolled a total of 1,124 participants. Most participants (91.5%) were aged between 18 and 40 years, and about two-thirds (67.7%) were females and completed college education (68.1%). Less than two-thirds (60.6%) were unemployed and nearly one-third (30.5%) were office workers. Approximately, three-quarters (71.2%) resided in urban areas and had a monthly income equal to or <1,000 JD (77.4%).

For the perceptions of participants of their surrounding built environment, nearly one-third (30.4%) reported good status of sidewalks, 47.3% reported bad status, and 22.2% denied the presence of sidewalks. Most of the study subjects (96.0%) reported the absence of specific paths for biking.

Less than two-thirds (61.2%) believed that buildings are crowded and there was no enough space between them. More

TABLE 2 Distribution of socio-demographic variables by walking and biking practices of study participants ($N = 1,124$).

Variable	Category	Walking or biking routinely at least 10–15 min to reach or return from places			*p*-value
		Yes (%)	No (%)	Total (%)	
Age	≤40	553 (52.9)	493 (47.1)	1,046 (100.0)	0.043
	>40	32 (41.0)	46 (59.0)	78 (100.0)	
	Total	585 (52.0)	539 (48.0)	1,124 (100.0)	
Gender	Male	197 (54.3)	166 (45.7)	363 (100.0)	0.303
	Female	388 (51.0)	373 (49.0)	761 (100.0)	
	Total	585 (52.0)	539 (48.0)	1,124 (100.0)	
Region	North	336 (53.8)	288 (46.2)	624 (100.0)	0.381
	Center	224 (49.6)	228 (50.4)	452 (100.0)	
	South	25 (52.1)	23 (47.9)	48 (100.0)	
	Total	585 (52.0)	539 (48.0)	1,124 (100.0)	
Residency	Urban	413 (51.6)	387 (48.4)	800 (100.0)	0.657
	Rural	172 (53.1)	152 (46.9)	324 (100.0)	
	Total	585 (52.0)	539 (48.0)	1,124 (100.0)	
Education	Up to high school	31 (45.6)	37 (54.4)	68 (100.0)	0.119
	Undergraduate	414 (54.1)	351 (45.9)	765 (100.0)	
	Postgraduate	140 (48.1)	151 (51.9)	291 (100.0)	
	Total	585 (52.0)	539 (48.0)	1,124 (100.0)	
Occupation	Unemployed	370 (54.3)	311 (45.7)	681 (100.0)	0.057
	Employed	215 (48.5)	228 (51.5)	443 (100.0)	
	Total	585 (52.0)	539 (48.0)	1,124 (100.0)	
Monthly income	<500 JD	198 (53.5)	172 (46.5)	370 (100.0)	0.003
	500–1,000 JD	278 (55.6)	222 (44.4)	500 (100.0)	
	>1,000 JD	109 (42.9)	145 (57.1)	245 (100.0)	
	Total	585 (52.0)	539 (48.0)	1,124 (100.0)	

than three-quarters (78.4%) thought that there were no places adequate for physical activity and nearly one-half (47.5%) denied the presence of those places at all. Regarding the status of physical activity places, less than one-half (48.1%) thought those places were good or acceptable. However, more than one-half (59.4%) reported those places as being inaccessible.

Regarding the physical activity of participants, about one-third of participants (31.8%) were physically active at least two times per week, more than one-half (52.0%) were routinely walking or biking, and the majority (82.5%) did not use the park for physical activity.

The association of socio-demographic variables with physical activity

The distribution of socio-demographic variables by physical activity "at least 2 times per week (except for walking)" is shown in Table 1. Gender was significantly associated with weekly physical activity ($p \leq 0.05$) and males (38.6%) were more physically active than females (28.5%). However, other socio-demographic factors were not significantly associated with weekly physical activity. For example, education was almost equally distributed across physical activity "at least two times per week".

Table 2 demonstrates the distribution of socio-demographic variables by walking and biking practices of participants. Age and monthly income were significantly associated with routinely walking and biking at least 10 min to reach or return from places ($p \leq 0.05$). Participants aged 40 years or less (52.9%) were more physically active than those aged more than 40 years (41.0%). The rate of routinely walking or biking was lowest among the subjects with a monthly income higher than 1,000 JD (42.9%). Other socio-demographic variables were not statistically related to walking and biking ($p > 0.05$).

As shown in Table 3, gender, residency, and monthly income were statistically related to the physical activity at the park ($p \leq 0.05$). Females (15.4%) were less physically active than males (22%). The rate of participants who did not use the park for physical activity was higher in rural areas (87.7%) compared

TABLE 3 Distribution of socio-demographic variables by physical activity at the park among study participants ($N = 1,124$).

Variable	Category	Physical activity at the park			*p*-value
		Yes (%)	No (%)	Total (%)	
1. Age	≤40	185 (17.7)	861 (82.3)	1,046 (100.0)	0.757
	>40	12 (15.4)	66 (84.6)	78 (100.0)	
	Total	197 (17.5)	927 (82.5)	1,124 (100.0)	
2. Gender	Male	80 (22.0)	283 (78.0)	363 (100.0)	0.006
	Female	117 (15.4)	644 (84.6)	761 (100.0)	
	Total	197 (17.5)	927 (82.5)	1,124 (100.0)	
3. Region	North	106 (17.0)	518 (83.0)	624 (100.0)	0.683
	Center	84 (18.6)	368 (81.4)	452 (100.0)	
	South	7 (14.6)	41 (85.4)	48 (100.0)	
	Total	197 (17.5)	927 (82.5)	1,124 (100.0)	
4. Residency	Urban	157 (19.6)	643 (80.4)	800 (100.0)	0.004
	Rural	40 (12.3)	284 (87.7)	324 (100.0)	
	Total	197 (17.5)	927 (82.5)	1,124 (100.0)	
5. Education	Up to high school	12 (17.6)	56 (82.4)	68 (100.0)	0.556
	Undergraduate	140 (18.3)	625 (81.7)	765 (100.0)	
	Postgraduate	45 (15.5)	246 (84.5)	291 (100.0)	
	Total	197 (17.5)	927 (82.5)	1,124 (100.0)	
6. Occupation	Unemployed	113 (16.6)	568 (83.4)	681 (100.0)	0.307
	Employed	84 (19.0)	359 (81.0)	443 (100.0)	
	Total	197 (17.5)	927 (82.5)	1,124 (100.0)	
7. Monthly income	<500 JD	48 (13.0)	322 (87.0)	370 (100.0)	0.017
	500–1,000 JD	101 (20.2)	399 (79.8)	500 (100.0)	
	>1,000 JD	48 (18.9)	206 (81.1)	254 (100.0)	
	Total	197 (17.5)	927 (82.5)	1,124 (100.0)	

to urban regions (80.4%). Further, participants with monthly income between 500 and 1,000 JD (20.2%) were using the park for physical activity more than participants with monthly income <500 JD (13.0%) or higher than 1,000 JD (18.9%). The remaining socio-demographic factors were not significantly associated with the physical activity at the park ($p > 0.05$).

The association of perceptions about built environment with physical activity

The relationship between participants' perceptions about the built environment with their physical activity at least 2 times per week (except for walking) is demonstrated in Table 4. Availability of specific paths for biking, presence of adequate places for physical practicing, number of physical activity places, status of physical activity places, and accessibility to those places were significantly associated with physical activity at least two times in the week ($p \leq 0.05$). Participants who denied the existence of specific paths for biking (31%) were less physically active than participants who reported the presence of those paths (48.9%). Regarding physical activity places, participants who reported the absence of places for physical activity (25.3%), a bad condition of these places (32.4%), or inaccessibility to those places (28.6%) were less physically active than their counterparts.

None of the perceptions about the built environment had a statistically significant association with "routinely walking or biking for at least 10 minutes to reach or return from places" ($p > 0.05$), as shown in Table 5. It is noteworthy to mention that the percentage of participants who were routinely walking or biking was higher than those who were not routinely walking or biking regardless of their perception about any of the built environment items, except for those who reported the absence of places for physical activity (49.4%).

Regarding the relationship between perceptions about built environment and physical activity at the park, sidewalk status and the spaces between buildings were significantly associated with the physical activity at the park ($p \leq 0.05$), as demonstrated in Table 6. Participants who denied the existence of the sidewalks (13.6%) were less physically active at the park compared to those who reported good (15.8%) or bad (20.5%) status of the

TABLE 4 Distribution of perceptions about built environment by physical activity at least 2 times per week of study participants ($N = 1,124$).

In your area of residence	Category	Physical activity at least two times per week (except for walking)			*p*-value
		Yes (%)	No (%)	Total (%)	
The condition of sidewalks	We don't have sidewalks	66 (26.4)	184 (73.6)	250 (100.0)	0.108
	Good	111 (32.5)	231 (67.5)	342 (100.0)	
	Bad	180 (33.8)	352 (66.2)	532 (100.0)	
	Total	357 (31.8)	767 (68.2)	1,124 (100.0)	
Are there specific paths for biking?	No	335 (31.0)	744 (69.0)	1,079 (100.0)	0.011
	Yes	22 (48.9)	23 (51.1)	45 (100.0)	
	Total	357 (31.8)	767 (68.2)	1,124 (100.0)	
What do you think about spaces between buildings?	Crowded	226 (32.8)	462 (67.2)	688 (100.0)	0.325
	Not crowded	131 (30.0)	305 (70.0)	436 (100.0)	
	Total	357 (31.8)	767 (68.2)	1,124 (100.0)	
Do you have enough places or areas of recreation for physical activity?	No	266 (30.2)	615 (69.8)	881 (100.0)	0.031
	Yes	91 (37.4)	152 (62.6)	243 (100.0)	
	Total	357 (31.8)	767 (68.2)	1,124 (100.0)	
What is the number of these places?	There is no place	135 (25.3)	399 (74.7)	534 (100.0)	<0.001
	1–2	128 (37.0)	218 (63.0)	346 (100.0)	
	>2	94 (38.5)	150 (61.5)	244 (100.0)	
	Total	157 (31.8)	767 (68.2)	1,124 (100.0)	
What is the condition of these places?	No places	133 (26.3)	373 (73.7)	506 (100.0)	<0.001
	Not good	129 (32.4)	269 (67.6)	398 (100.0)	
	Good	95 (43.2)	125 (56.8)	220 (100.0)	
	Total	357 (31.8)	767 (68.2)	1,124 (100.0)	
Are these places accessible to you?	Not accessible	191 (28.6)	477 (71.4)	668 (100.0)	0.006
	Accessible	166 (36.4)	290 (63.6)	456 (100.0)	
	Total	357 (31.8)	767 (68.2)	1,124 (100.0)	

sidewalks. Moreover, a higher rate of physical activity at the park was reported among participants who perceived buildings in their area as crowded (20.6%) compared to those who perceived it as not crowded (12.6%).

Discussion

The main purpose of this study was to estimate the relationship between the perceived built environment in residential areas of adult Jordanian and their physical activity–related practices. Findings generally demonstrated that people living in Jordan were not well-engaged in physical activities, as most of them were not physically active at least two times per week (68.2%), and around one-half (48.0%) do not actively transport between places (i.e., walking or biking routinely at least 10–15 min). There is a strong connection between physical activity and the perceived built environment as illustrated in this study and supported by evidence in the literature (Smith et al., 2017; Vancampfort et al., 2019). One example is a study in Australia that showed that levels of moderate and vigorous physical activities were positively enhanced by recreation facilities such as parks among adolescents living in Melbourne city (Loh et al., 2019). Another one adult living in Palma city, Spain, who had an adequate accessibility to walk-friendly routes, reported higher levels of moderate to vigorous physical activity compared to people living in areas with inaccessibility to those routes (Colom et al., 2019). In Japan, the presence of sidewalks and the accessibility to recreational facilities were significantly associated with the number of steps taken by community-dwelling ambulatory patients with stroke (Kanai et al., 2019). The logistic regression analysis of data collected from 1,124 Portuguese adolescents showed a significant association between the availability of low-cost or free recreational facilities in the surrounding neighborhood and physical activity among Portuguese girls (Santos et al., 2009). Moreover, neighborhood characteristics with higher walkability scores were significantly associated with more walking rates among older people living in King County of Washington state (Berke et al., 2007).

TABLE 5 Distribution of perceptions about built environment by walking or biking practices of study participants ($N = 1,124$).

In your area of residence	Category	Walking or biking routinely at least 10-15 minute to reach or return from places			p- value
		Yes (%)	No (%)	Total (%)	
The condition of sidewalks	No sidewalks	130 (52.0)	120 (48.0)	250 (100.0)	0.704
	Bad	283 (53.2)	249 (46.8)	532 (100.0)	
	Good	172 (50.3)	170 (49.7)	342 (100.0)	
	Total	585 (52.0)	539 (48.0)	1,124 (100.0)	
Are there of specific paths for biking?	No	558 (51.7)	521 (48.3)	1,079 (100.0)	0.291
	Yes	27 (60.0)	18 (40.0)	45 (100.0)	
	Total	585 (52.0)	539 (48.0)	1,124 (100.0)	
What do you think about spaces between buildings?	Crowded	347 (50.4)	341 (49.6)	688 (100.0)	0.175
	Not crowded	238 (54.6)	198 (45.4)	436 (100.0)	
	Total	585 (52.0)	539 (48.0)	1,124 (100.0)	
Do you have enough places or areas of recreation for physical activity?	No	463 (52.6)	418 (47.4)	881 (100.0)	0.517
	Yes	122 (50.2)	121 (49.8)	243 (100.0)	
	Total	585 (52.0)	539 (48.0)	1,124 (100.0)	
What is the number of these places?	There is no place	264 (49.4)	270 (50.6)	534 (100.0)	0.233
	1–2	186 (53.8)	160 (46.2)	346 (100.0)	
	>2	135 (55.3)	109 (44.7)	244 (100.0)	
	Total	585 (52.0)	539 (48.0)	1,124 (100.0)	
What is the condition of these places?	No places	250 (49.4)	256 (50.6)	506 (100.0)	0.265
	Not good	214 (53.8)	184 (46.2)	398 (100.0)	
	Good	121 (55.0)	99 (45.0)	220 (100.0)	
	Total	585 (52.0)	539 (48.0)	1,124 (100.0)	
Are these places accessible to you?	Not accessible	343 (51.3)	325 (48.7)	668 (100.0)	0.570
	Accessible	242 (53.1)	214 (46.9)	456 (100.0)	
	Total	585 (52.0)	539 (48.0)	1,124 (100.0)	

Physical activity was significantly related to several built environment characteristics, namely, presence of specific paths for biking ($p = 0.011$), presence of adequate places for physical activity ($p = 0.031$), status of physical activity places ($p \leq 0.001$), status of sidewalks ($p = 0.037$), and accessibility to physical activity places ($p = 0.006$). Similarly, Zhou et al. (2017) studied the effect of the built environment on physical activities among 3,094 adults living in Huainan, China, 2010–2015. The availability of recreation facilities was associated with enhanced levels of physical activity among adults, and the lower accessibility to those facilities reduced the physical activity levels, especially among the older population (Zhou et al., 2017).

This study also revealed that people living in areas with crowded buildings were more physically active than people living in places with adequate spacing between buildings ($p = 0.001$), and this is mostly related to the greater investment associated with a higher density of population which makes the environment more suitable for walking and physical activity due to the availability of more services in the neighborhood as concluded by Weber Corseiul Giehl et al. (2016) study, which reported a positive association between higher density of population and walking for transportation among 1,705 Brazilian adults aged 60 years or more living in Florianopolis (Weber Corseiul Giehl et al., 2016).

Among the study population, walking or biking routinely for at least 10 min to reach or return from places was not significantly associated with the perceived built environment. A similar finding was noted by the study of Graziose et al. (2016) reporting that self-efficacy of walking or biking for exercise or transport was not associated with public density, walkability, or park access among children living in New York City during the year of 2012 (Graziose et al., 2016). Different results were found in a southern rural area in the United States of America in 2012, which showed that walking to the destination was significantly different between neighborhoods with traditional built environment and neighborhoods with a suburban built environment (Li et al., 2018).

Older people in our study were walking or biking between places less than younger people aged 40 years or lower ($p = 0.043$). A Chinese study in 2016 showed that adults younger

TABLE 6 Distribution of perceptions about built environment by physical activity at the park among study participants ($N = 1,124$).

In your area of residence	Category	Physical activity practice at the park			*p*-value
		Yes (%)	No (%)	Total (%)	
The condition of sidewalks	No sidewalks	34 (13.6)	216 (86.4)	250 (100.0)	0.037
	Bad	109 (20.5)	423 (79.5)	532 (100.0)	
	Good	54 (15.8)	288 (84.2)	342 (100.0)	
	Total	197 (17.5)	927 (82.5)	1,124 (100.0)	
Are there of specific paths for biking?	No	186 (17.2)	893 (82.8)	1,079 (100.0)	0.229
	Yes	11 (24.4)	34 (75.6)	45 (100.0)	
	Total	197 (17.5)	927 (82.5)	1,124 (100.0)	
What do you think about spaces between buildings?	Crowded	142 (20.6)	546 (79.4)	688 (100.0)	0.001
	Not crowded	55 (12.6)	381 (87.4)	436 (100.0)	
	Total	197 (17.5)	927 (82.5)	1,124 (100.0)	
Do you have enough places or areas of recreation for physical activity?	No	154 (17.5)	727 (82.5)	881 (100.0)	0.938
	Yes	43 (17.7)	200 (82.3)	243 (100.0)	
	Total	197 (17.5)	927 (82.5)	1,124 (100.0)	
What is the number of these places?	There is no place	82 (15.4)	452 (84.6)	534 (100.0)	0.143
	1–2	64 (18.5)	282 (81.5)	346 (100.0)	
	>2	51 (20.9)	193 (79.1)	244 (100.0)	
	Total	197 (17.5)	927 (82.5)	1,124 (100.0)	
What is the condition of these places?	No places	78 (15.4)	428 (84.6)	506 (100.0)	0.211
	Not good	79 (19.8)	319 (80.2)	398 (100.0)	
	Good	40 (18.2)	180 (81.8)	220 (100.0)	
	Total	197 (17.5)	927 (82.5)	1,124 (100.0)	
Are these places accessible to you?	Not accessible	109 (16.3)	559 (83.7)	668 (100.0)	0.197
	Accessible	88 (19.3)	368 (80.7)	456 (100.0)	
	Total	197 (17.5)	927 (82.5)	1,124 (100.0)	

than 75 years old exceeded those older than 75 years old by at least 150 min in time consumed in physical activities (Lu et al., 2018). The decline in physical activity by aging may be related to the reduction of muscle mass and strength among older adults leading to unwillingness to practice. Furthermore, the incidence of chronic diseases increases with age which makes patients less active, fearing from further pain, tissue damage, or physical injury (Wu et al., 2019; Niemiro et al., 2022). Moreover, there is increased evidence that obesity and non-communicable diseases are on a rise in the middle east region (Kilpi et al., 2014).

This study revealed that males in Jordan were significantly more physically active than females; participating in physical activities at least two times in the week ($p = 0.001$) and routinely practicing physical activities at the park ($p = 0.006$). Men sport clubs and fitness centers are more predominant than women fitness centers, which could attribute to the higher physical activity levels among men. In line with our study, men (28.1%) living in Spain were significantly ($p \leq 0.001$) more likely to engage in moderate to vigorous physical activities compared to women (15.1%) in a study conducted between 2013 and 2016 (Colom et al., 2019). The discrepancy in physical activity by gender could be explained by the greater concerns of women about neighborhood safety, cultural barriers, and time constraints due to familial responsibilities (Oluyomi et al., 2014). In recent years, Jordan had witnessed an increased number of fitness centers for women, indicating an increased demand for such places. Yet, most of these centers don't have a variety of sports and are exclusively for fitness exercises. This is unlike men sport clubs that vary in the types of sports offered.

Another demographic variable that was associated with physical activity is income. Monthly income of 1,000 JD or less was associated with more walking, biking, and physical activity practices among our participants. In the city of Valencia, Spain, students living in lower-socioeconomic neighborhoods were more actively commuted within their neighborhoods to reach or return from their universities compared to students living in a higher-socioeconomic environment (Molina-García et al., 2019). The association between socioeconomic status and physical activity mostly reflects the availability of more leisure time among people living in a lower-socioeconomic environment (Wu et al., 2019) or the absence of other options for transportation (Sallis et al., 2018). Among the study participants,

people living in urban regions had a significantly higher rate of physical activity at the park compared to people living in rural areas ($p = 0.017$). Similarly, among 286 students living in the southeastern United States, the mean of moderate to vigorous-intensity physical activity was significantly higher among urban youth (19.2 min/day) compared to rural youth (15.9 min/day) (Moore et al., 2013). This is mostly related to the urban environment which provides the population with more recreational facilities that promote physical activity such as parks and playgrounds (Duncan et al., 2012; Moore et al., 2013; Smith et al., 2017; Li et al., 2018).

Although practices related to physical activity in our study were measured subjectively without using any standard measurements which could over- or underestimate the levels of physical activity, study findings provided a good insight on levels of physical activity among the Jordanian population and their perceptions about quality of the built environment in their residential area that could affect their physical activity and practices.

Limitations

The cross-sectional design limited the causality relationship in the study, as both dependent factors (i.e., physical activity-related practices) and independent factors (demographic variables and knowledge about perceptions about built environment) were measured simultaneously, so the temporality could not be revealed. In addition, practices related to physical activity were measured subjectively without using any standard measurements, which could lead to over- or underestimation of physical activity among our study population.

Regarding those who participated, middle-aged adults (18–40 years), females, people living in urban areas, people living in the north or central regions, and undergraduates represent the predominant subjects of the study and this is mostly attributed to the way the data were collected, indicating a potential bias to the obtained results. Moreover, people with no Facebook accounts and people who did not participate in any Facebook group could not participate in the study.

Other variables that may influence physical activity such as social stigma, leisure time, and the disease status of the participants were not measured.

Conclusion

Levels of physical activity among Jordanian adults are relatively low which needs urgent and effective steps for improvement as it affects the wellbeing of the community. Practices related to physical activity in Jordan were associated with the availability of specific biking paths, number of physical activity places, status of those places, accessibility to those places, status of the sidewalks, and the spaces between buildings. Therefore, enhancing the built environment is considered a cornerstone in any national health behavior plan that includes physical activity as one of its components. In addition, it recommended that health education related to physical activity is incorporated in school and university curriculums and other community organizations to enhance physical activity among the public since changes to the built environment need a higher level of efforts and high financial and political demands. Moreover, given the preliminary results, there is a need for much more comprehensive research that could investigate the effects of built environment on physical activity.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Study protocol was approved by the Institutional Review Board (IRB) of Jordan University of Science and Technology (JUST). Participation consent was secured from every study participant. Data collection forms did not contain any item that could refer to the identity of participants. Data generated from this study were used for research purposes only and were treated confidentially during the entire process of the research.

Author contributions

RS conceived the idea, designed the study, and collected data. AO analyzed the data. RS and AO contributed to the writing of the manuscript. MA critically reviewed the final version. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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