

Assessing the Impacts of Urban Determinants on Physical Activity Engagement: An Applied Study on Residents of Alexandria City, Egypt

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1 ABSTRACT

Planning of cities during this decade is oriented to car use, and therefore physical environment that encourages physical activity in the streets is neglected and drastically affected. Studies showed that features that have the strongest effect on residents differ from a community to another depending on culture, social norms and others. This paper identifies the built environment factors that have the most significant influence on engaging residents to physical activity in Alexandria City, Egypt. It also investigates the barriers and facilitators that the residents face while commuting the city. In this study two surveys were conducted, the first (survey I) assessed the value and frequency of participation of residents to physical activity in Alexandria city and identified the specific facilitators and barriers that affects their participation in any kind of physical activity. The second survey (survey II), followed the International Physical Activity Questionnaire – Long Form (IPAQ-LF) to measure the current level of the residents' physical activity. The two surveys are complementary and both revealed the relationship between urban environment features and the associated impacts on physical activities of residents. The results demonstrated the level of physical activity of residents, the satisfaction level of main features with a photo demonstration and locations that affect the ability to frequently engage in physical activity in Alexandria city. It is resulted that urban and street design is the highest motivator that could increase the physical activity of residents. The “availability of open and green areas” has the least satisfaction level from residents, but it is the highest influencing facilitator for physical activity. “Congestion of streets”, “lack of time” and “pollution” are from the significant barriers that reduce the engagement of residents in any form of physical activity.

Keywords: Physical Environment Features, Facilitators and Barriers, Satisfaction, Physical Activity Engagement

2 INTRODUCTION

People living in cities are facing various barriers and challenges to being physically active every day. According to Frank and Engelke (2001), urban planning was dominated by a strong focus on cars for decades. The widespread implementation of car-oriented land use and transportation developments have ignored or underestimated the underlying public health consequences. In such environments, where there is heavy reliance on car use, people spend more time on travelling instead of on health-improving activities. This is now changing to a focus on creating cities for people. Today's current concern in cities is to plan urban environments that are responsive to the citizen's everyday needs, improve their quality of life and maintain their health.

Relationships between physical activity and health status are more and more recognized in the literature (Ulijaszek, 2018). The Transportation Research Board and Institute of Medicine (2005), indicated that although individual engagement in physical activity results to some degree from personal choice, it is also a function of the built environment. Researchers and practitioners have come to appreciate the importance of the built environment in facilitating or constraining walking and physical activity (Saelens & Handy, 2008). Salvo, M. Lashewicz, et al. (2018), Ivory, et al. (2015) and Belon, et al. (2014), among other researchers suggest that the physical environment has an influence on the physical activity of people. Thereby, the physical environment can operate as a barrier, a facilitation condition, or contextual influence and the way we build our cities, design the urban environment and provide access to the natural environment can be a great encouragement or a great barrier to physical activity and active living (WHO-Europe, 2006). With the majority of the population living in cities, it is sensible to look at how urban environments have changed, influenced lifestyles, and contributed to the increase in overweight and obesity (Frumkin, 2002). It is challenging, yet essential to develop a better understanding of the features that mostly influence the physical activity.

2.1 Physical activity status in the Middle East and Egypt

Evidence suggests low levels of physical activity among arab adults living in Middle Eastern countries. According to the WHO (2014), barriers to physical activity in the Eastern Mediterranean Region include competing family demands, such as childcare and household chores; long working hours; heavy school workloads; other competing priorities, such as socializing; lack of affordable leisure facilities; lack of outdoor spaces, such as parks, to be physically active; inadequate public transport systems and heavy reliance on cars; lack of ‘walkable’ neighbourhoods; feeling unsafe; and climate.

2.1.1 Status in Egypt

In 2009, A Survey of Young People in Egypt (SYPE) by the Egyptian ministry of planning, monitoring and administrative reform with contribution from the Population Council and the Central Agency for Public Mobilization and Statistics (CAPMAS) was conducted for the first time. A second round of the survey was conducted in 2014. The survey concentrated on youth of ages between 10 and 29 and focuses on key aspects of their lives including education, employment, health, family formation, migration, reproductive health, social issues and civic/political participation.

These survey included a series of questions asking about their daily physical activities, including biking and walking, going to a gym, playing sports, or physical work on the job. The results showed that nearly half (45.8%) of SYPE respondents do not engage in physical activities daily. Nearly twice as many young women (59.2%) did not exercise as men (33.3%). SYPE participants aged 13-17 were more likely to indicate daily exercise (66.8%) than the those aged 30-35 (49.0%).

This can be attributed to the lack good streetscape in most of the streets in Egypt as indicated by Rehan (2013), where this adversely affects the behavior of users and esthetic aspects of built environment, and thus deterioration of the visual image of most Egyptian cities. Other reasons for less engagement of physical activity is what Traill (2006) stated, which is that people engage less in physical activity due to urbanization, the sedentary nature of jobs, as well as the speed and convenience of driving rather than walking or biking. All these features promote an unhealthy lifestyle with low physical activity levels specially that being physically active is not common in Egyptian culture. This contributes to a sedentary lifestyle and consequently, to obesity and various non-communicable diseases.

2.1.2 Urban Environment in Alexandria City

According to Elsayy et al. (2017), Alexandria city witnessed an evident shift during the last few decades due to its rapid urbanization. This has contributed to numerous urban, social and environmental issues; such as traffic congestion, environmental pollution, decrease in green areas and degradation of the urban quality of living

As a consequent to rapid urban densification and population growth in the past recent years, the problem of squatting has occurred. The speedy construction of illegal 20-story high rise apartment blocks (Fig. 1) in major cities in public defiance and violation of building laws caused high population density, which jam traffic flows and burden services and utilities beyond their limited capacities. All these problems have had a mass effect on the individual’s health (physically, mentally and physiologically) (Zahran, 2014).



Fig. 1: High apartment blocks

Another kind of squatting that appeared fiercely, was the infectious infiltration of vendors squatting and invading sidewalks (Fig. 2 and 3), squares, streets, public parks and public land, forcing pedestrians to walk in the streets and to mingle chaotically with cars. The common use of sidewalks by shop owners, cafeterias,

coffee shops (Fig. 4), repair shops, and garages had become a familiar scene, compounded by their habitual occupation by parked cars (Fig. 5,6 and 7), by vendors and rural women selling their produce. This congestion is multiplied by unruly car owners who park their cars illegally in two and three rows on street lanes, especially in city centres and near shopping malls, thus causing traffic snarls and strangling jams (Zahran, 2014). All are considered as barriers for physical activity because people experience very hard times to walk comfortably on the sidewalks.



Fig. 2,3 and 4: Invasion of sidewalks by restaurants and vendors



Fig. 5, 6 and 7: Cars parking on sidewalks and pedestrian paths

This study aims to identify and develop a better understanding of the built environment features that have the most significant effect on the residents and accordingly influence their engagement in physical activity levels in Alexandria City, Egypt. The study also explores the barriers and facilitators that the residents face while commuting in the city.

3 METHODS AND TOOLS

According to Welk, G. (2002), physical activity can be assessed using objective or subjective methods. Objective methods such as accelerometer, pedometer, motion sensors, heart-rate monitors, etc are used as they are easy and small wearable monitoring devices that objectively measure physical activity under free living conditions, yet they do not provide information about the type of activity. Subjective methods such as surveys, questionnaires, diaries, etc. are the most commonly used in studies as they are inexpensive, a reliable alternative in a large sample size and they capture more detail about a diverse range of physical activities which enriches more the data collected. Technological advancement devices such as: GPS devices are used in measuring physical activity because they track the route of individual and can assess actual travel behavior, yet complimentary methods are needed with it to specify type of physical activity. McKenzie, (2002) point out that direct observation exceeds other measures of physical activity in providing contextually rich quantitative and qualitative data, especially with regard to the what, when, where and with whom it occurs.

Measuring built environment has also been achieved in studies through various methods and tools. Geographic Information System (GIS), offer accurate indicators (Brownson et al. 2009). Observational audits are also from the efficient methods in studies. Lately virtual observational audit tools such as “Visual STEPS ” and “Google Street View (GSV)” were used in studies Steinmetz-Wood et al.(2019), but according to Lafontaine et al. (2017) they do not incorporate sensory inputs such as noise levels, soundscape, and scent that may contribute to a pedestrians experience of a streetscape. Photo-voice methods, focus groups, face to face interviews and surveys are also from the commonly used methods.

3.1 Adopted Methodology Framework

To fulfil the main aim of the research paper, the methodology framework adopted investigated how the built environment features in Alexandria city can affect the engagement of resident in physical activity. The features selected for this study cover not only urban aspects, but also social (such as: support from family and friends), and safety aspects (like: from crime, injury and accidents). They are proven to have an effect on residents’ physical activity in previous studies such as: Bellows-Riecken et al. (2013) and Belon, et al. (2014). Features like “lack of time”, “traditional dress” and “cultural lifestyle” are also selected in the study to cover sociocultural aspects because according to Donnelly, et al. (2018) they are also reported as reasons that hinder physical activity.

This study adopts an analytical framework that started by screening the available tool and methods for measuring built environment and physical activity of residents in previous studies. This step was followed by implementing the selected methodology for the study. The selected methodology comprised two complimentary surveys. Survey (I) assessed the value and frequency of residents’ participation to physical activity in Alexandria city. It also measured their current satisfaction level towards 9 determinants (e.g.: quality of streets and sidewalk, availability of green areas, opportunity to walk for certain destinations, for leisure and exercising, opportunity to bike, the availability and quality of public transportation). The survey also identified the specific facilitators and barriers that affects the participation in any kind of physical activity in addition to an onsite observation took place to locate the urban environmental features mentioned in the surveys with photo demonstrations. After collecting the responses of residents, relative weighing analysis method was applied in order to: a) Arrange the 9 determinants in order of the residents’ satisfaction level, from the determinant with the highest satisfaction level to the lowest, b) arrange the facilitators and barrier features from those having the highest influence on residents to the lowest.

Survey (II) followed the International Physical Activity Questionnaire – Long Form (IPAQ-LF) to measure the current level of the residents’ physical activity in Alexandria city. Hagstromer et al. (2005) indicated that most existing questionnaires focus on physical activity during leisure time or at the workplace, which limits the use of these instruments. Only a few of the existing surveys capture physical activity in a variety of daily situations, such as transportation, occupation, household and family care, and leisure time. A key feature of the IPAQ form is its ability to provide, in detail, participation estimates for multiple domains of physical activity, including leisure-time physical activity, physical activity for transportation, physical activity in the home and physical activity at work (Craig, et al. 2003). Figure 8 below, is a diagram that demonstrates the adopted methodology framework.

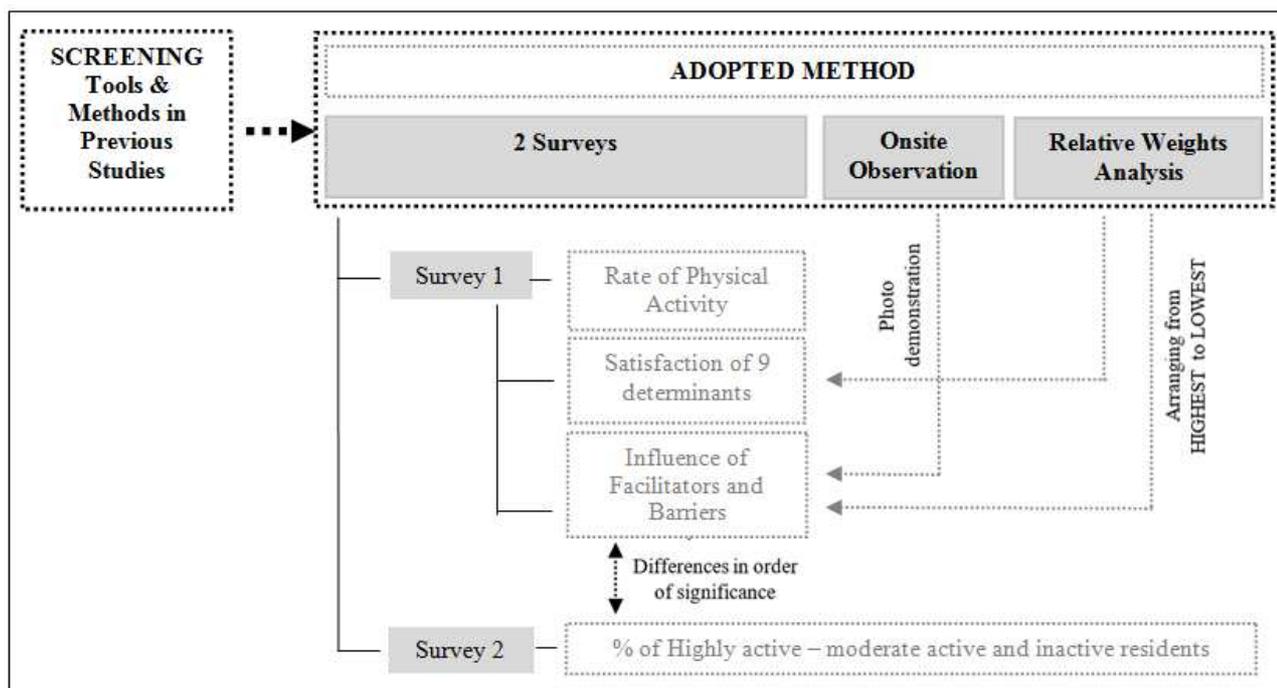


Fig.8: Methodology Framework Diagram of the Study

3.2 Sampling

The Survey targeted Alexandria residents in 6 age groups (>20 years, 22-25 year, 26-30 years, 31-40 years, 41-50 years and <50 years) through online google form (posted in Arabic and English languages) and was spread through social media channels. Most of the responses were from individuals under 50 years old. The survey accepted responses from residents until most variables were covered. Some elderly Alexandrians were interviewed personally.

3.3 Data Collection:

Survey (I) is divided into 4 parts, each part focuses on a particular issue for collecting the data.

- Part 1 is concerned with collecting biodata about the respondents, the value of physical activity to them relative to their other daily activity through a 5 likert scale, data about the respondents' rate of exercising and what motivation would increase that rate.
- Part 2 gathers data about the preferences and satisfaction of residents while commuting. Residents were asked to rate their satisfaction level towards 9 current determinants also on a likert scale from 1 to 5; with 1 for the lowest satisfaction and 5 for the highest.
- Part 3 explores 13 built environment features that would encourage and facilitate the residents to participate more in physical activity (i.e. facilitators)
- Part 4 concentrates on 13 barriers that hinders the residents from participating in physical activity.

Survey II collected data about the physical activity of residents using the IPAQ-long form following the "Guidelines for Data Processing and Analysis of the International Physical Activity Questionnaire (IPAQ)" in three domains; work physical activity, transportation physical activity and Leisure physical activity. Each domain is calculated separately, to scope the most dominant domain for physical activity of participants, then all domains were merged together to specify the respondents' physical activity levels (High, Moderate or Low). There is a fourth domain in the IPAQ long form which is concerned with the outdoor housework such as: gardening, yard work, shoveling snow and chopping wood. These kinds of housework are not common in Egyptian culture. Hence, Part 3 of the survey is excluded from Survey II.

3.4 Data Analysis:

3.4.1 Survey (I):

Responses of residents were collected, filtered and then analysed. Responses were then calculated in percentages in order to determine : a) the value of physical activity, b) how often do residents exercise, c) reasons for not exercising regularly, d) motivations that would increase their engagement in physical activity, that were then grouped into 5 clusters (urban, personal, social, safety and economic), d) the satisfaction level of residents towards 9 determinants in the city, and finally e) the influence of facilitators and barriers that residents meet while commuting. The respondents were asked to choose the 5 most significant facilitating features (out of 13 feature) that would encourage them to walk more for leisure and for physical activity (part 4), and to choose the 5 most significant barriers (out of 13 barriers) that they meet while commuting in the streets for leisure or for physical activity (part 5). Then the satisfaction level and influence of facilitators and barriers (part 3,4 and 5) were arranged in order of satisfaction and influence by applying relative weight analysis to arrange them from the highest to lowest using the following equation:

Where, each of the corresponding 5-point scale rating was multiplied by the number of respondents who gave that rating, summing them up, and then dividing them by 5 (the highest point scale) and total number of respondents.

3.4.2 Survey (II) - International Physical Activity Questionnaire – Long Form (IPAQ-LF):

To calculate the total physical activity according to the IPAQ Guidelines for the data processing and analysis of the International Physical Activity Questionnaire (2005), the data were transformed into energy expenditure estimated as the total metabolic equivalent (MET) using published values and recommendations from the IPAQ scoring protocol. To calculate the daily physical activity in MET minutes per week, the number of minutes/day reported in each activity level was multiplied by number of days/week then multiplied by its specific MET score (MET-minutes per week: minutes of activity/day x days/week x MET

score). MET scores were as follows: walking/light Physical activity = 3.3 METS, Moderate Physical activity = 4 METS, Cycling for transportation= 6.0 METs and Vigorous Physical activity = 8 METS

IPAQ is available in two formats (short and long forms). An important difference between the long and short forms of the IPAQ, the IPAQ long form provides information about time spent in physical activity for each domain, whereas in the short form, the outcome is only a total score for physical activity (Sebastião et al. 2012). The Guidelines for Data Processing and Analysis of the International Physical Activity Questionnaire (IPAQ) (2005), divided respondents into 3 physical activity levels according to their total score (High, Moderate and Low).

- “HIGH” Physical activity is any one of the following 2 criteria: a) Vigorous-intensity activity on at least 3 days and accumulating at least 1500 MET-minutes/week OR b) 7 or more days of any combination of walking, moderate- or vigorous- intensity activities accumulating at least 3000 MET-minutes/week.
- “MODERATE” Physical activity is either of the following 3 criteria: a) 3 or more days of vigorous-intensity activity of at least 20 minutes per day OR b) 5 or more days of moderate-intensity activity and/or walking of at least 30 minutes per day OR c) 5 or more days of any combination of walking, moderate-intensity or vigorous intensity activities achieving a minimum of at least 600 MET-min/week.
- “LOW” Physical activity (inactive) is when there is no activity reported OR Some activity is reported but not enough to meet the previous 2 categories (HIGH and MODERAT physical activity)

4 RESULTS AND DISCUSSION

Responses received from the surveys were 242 responses from both genders. They were divided into 6 age groups as mentioned earlier. Data collection indicates that the most responsive age group are the age from 31-40 years (42% of respondents). 55% of the respondents has a bachelor degree, 31% has master and Ph.D and the rest are university students. Of all respondents, 79% are employed and therefore they commute every day from home to their work locations. And so the results obtained are from an education level that can be relied on.

Motivation type	Responses	
1. Urban <i>a. Street Design:</i> (35%)	Availability of suitable sidewalks (flat, wide, continuous/unobstructed and well paved) to walk and exercise	Presence of aesthetic mental image Removing vendors and coffee shops that are invading large spaces of the sidewalk
	Availability of safe wide green areas, open spaces and gardens with pedestrian paths	Adequate lighting in the streets at nights Cleanliness
	A place providing services and amenities such as seating Cycling lane	Trees and shaded areas
<i>b. Proximity</i> (5.5%)	Places close from home	Having gym facilities nearby
<i>c. Traffic</i> (3.3%)	Less congestion in terms of cars	Away from vehicle noise
	Available of public transportation modes Presence of traffic light signs that allow pedestrians to cross safely	Less car fumes Low speed of vehicles Fixed itineraries
2. Personal (26%)	Having more time Good weather Maintaining health, wellness and weight loss No crowdedness and comfortability	Suitable outfit Shopping Presence of places where practising physical activity is fun
	Gym facility (7.1%)	Privacy and security Cleanliness Gym offering a kids safe area for children
3. Social (17%)	Encouragement and support from friends or family	Having company Seeing people exercising in the street
4. Safety (4%)	Safe environment Not getting harassed	Keeping away from vehicles for safety
5. Economic (1.6%)	Presence of places with reasonable prices	

Table 1: Categorized Responses to Motivations of Physical Activity

4.1 Survey (I):

Results of part 1 of the survey shows that from the respondents, 38% valued the physical activity moderately (value of 3 out of 5), 34% valued physical activity highly (with value of 4 and 5 out of 5). As for rates of exercising, only 22% of respondents exercise regularly, 58% exercise “irregular/sometime” and 20% do not exercise. Results also indicates that men exercised regularly more than women (30% and 17% respectively).

This can be attributed to the traditional roles that women play within society, such as the responsibility for childcare and household chores, which may give them less time to participate in physical activity.

“The lack of time (45%)” and “the lack of places to walk, stroll or run comfortably (24%)” are the main reasons that is preventing the 20% that are not exercising from exercising regularly. “Cafes and restaurants invading the sidewalks by their tables”, “not being used to regularly exercise” and “the lack of awareness of the importance of regular physical activity” are additional reasons that were added by the respondents. Table 1 (below) demonstrates some of the motivations that were mentioned by residents, they are grouped into clusters and represented in percentages. It shows that “urban” motivations, specifically the presence of suitable street design, have the highest percentage (35%) that motivate respondents to do more physical activity. This indicates that urban features in the city are the most important driver of physical activity which directly affects the general health condition, mental health and social affairs of residents. Following to Urban features, was the personal motivations as the second important motivator for physical activity.

Results of Part 2, are represented in Table 2 (below). It displays the 9 determinants, the satisfaction level of each and their arrangement in the order satisfaction levels (from highest to lowest) resulting from the relative weighting method. It depicts that the majority of satisfaction levels of respondents were low (varied between 1 and 3 on likert scale) which concludes that the determinants are not in the expected satisfaction level of residents and that further analysis is needed in order to identify the reasons for the dissatisfaction.



Fig. 9: Example to Green/open areas in Alexandria

	1 Low satisfaction scale	2	3	4	5 High Satisfaction scale	Relative weights	Arrangement (highest to lowest satisfaction)
Availability of public transportation	16%	24%	30%	20%	10%	56.8	1
Walking to a certain destination (near home)	16%	28%	34%	14%	8%	54.4	2
Opportunity to walk for leisure	21%	32%	26%	14%	7%	50.8	3
Opportunity to walk for exercising	38%	27%	19%	10%	6%	44.0	4
Quality of Public transportation	32%	32%	27%	5%	4%	43.0	5
Quality of streets	35%	31%	26%	5%	3%	41.8	6
Quality of sidewalks (walking)	43%	30%	14%	8%	5%	40.2	7
Opportunity to bike in the streets	51%	19%	15%	8%	7%	40.0	8
Availability of open/green areas	51%	26%	14%	3%	6%	36.8	9

<i>Availability of public transportation</i>	busses not available in all routes - no prompt scheduling
<i>Walking to a certain destination</i>	crowdedness - vandalism - pollution
<i>Opportunity to walk for leisure</i>	crowdedness –harassment (for girls) – Lack of adequate lighting – presence of obstacles - no green spaces - no spaces to walk freely and feel safe.
<i>Opportunity to walk for exercising</i>	Limited places (cournich street only or inside clubs)
<i>Quality of Public transportation</i>	not clean – no maintenance - people abuse it
<i>Quality of streets</i>	Always crowded – some traffic street lights doesn’t work to cross safely
<i>Quality of sidewalks (walking)</i>	Narrow and high - used by shops/cafes - motorcycles uses sidewalks to park - presence of obstacles – no seating available
<i>Opportunity to bike in the streets</i>	Very dangerous to ride it in the streets with cars - can’t ride on sidewalk
<i>Availability of open/green areas</i>	The public ones are not safe - not clean and no maintenance

Table 2: Level of Satisfaction of Respondents (%) and Relative Satisfaction Level. Table 3: Problems Faced by Respondents concerning the 9 Determinants

The 3 determinants that took the highest satisfaction level were: “availability of public transportation”, followed by “walking to near destinations near home” because residents are used to the surrounding around their homes, then the “opportunity to walk for leisure” as the third place. The lowest satisfaction level was given to the “availability of open/green areas” because open and green spaces are limited, and the available ones are either neglected or in remote places. Following to Table 2, some general reasons for the respondents’ rating in Survey (I) are displayed in Table 3.

Results of Part 3 and 4 demonstrates the order of features from highest to lowest influence on residents after applying the relative weighing analysis method (Table 4 below). This ordering helps deepen the understanding of the most significant features that affects the behaviour and physical activity of residents positively or negatively.

Table 4 reveals that the physical activity facilitators that have the highest significance is the “presence of trees and green areas”, this is because they provides a better environment for the residents. It makes them feels relaxed and calm instead of being surrounded by cars and fumes causing constant stress and uncomfartability. Hence, it is urgent to start taking more care and increase the urban and green spaces to raise its satisfaction level and therefore induce the physical activity of residents. Trees are more available in some of the streets to provide shade in sunny days, lower the temperature and gives a good surrounding atmosphere. This is why shaded areas came as the second facilitator. However, trees can act as obstacle at places with narrow sidewalks. The presence of “streetlights” was the third facilitator as some streets in Alexandria are not adequately lit, and that induces an unsafe feeling. “Feeling safe from injury or crime” is the fourth facilitators. The sense of safety is essential for one to move freely and comfortable in the streets. Finally “presence of sidewalk network” is the fifth facilitator as it gives the pedestrians their space to walk and enjoy moving freely and safely. This can also be achieved by: a) widening the sidewalks, because there are some places in Alexandria that have narrow sidewalks, and other places have no sidewalk to walk on, and b) removing the obstacles that are on the sidewalk such as vendors, cafe tables, cars parking on sidewalks



Fig. 10 and 11: Presence of Trees in Streets. Fig. 12: Trees as Obstacles in Narrow Sidewalks.

Significance	Facilitators	Relative weight	Barriers	Relative weight
	Trees and green spaces	38.8	Congestion/crowdedness of streets	25.0
	Shaded areas	30.8	Lack of time	22.6
	Streetlights	27.6	Pollution	18.8
	Feeling safe from injury or crime	25.6	Weather conditions	12.8
	Presence of sidewalk network	25.2	Lack of facilities	12.2
	Presence of traffic signals and safe crossings	21.6	Culture and lifestyle	11.4
	Pedestrian only footpaths	17.4	No habit of exercising	10.0
	Presence of benches and seating	15.6	Dependency on cars	9.4
	Seeing other people walking	13.6	Lack of adequate public transportation	7.2
	Outdoor spaces, plazas and squares	11.0	Fear of Accidents	6.6
	Attractive buildings and views	9.6	Traditional dress dress not convenient for participating in physical activity	5.80
	Presence of shopping streets and restaurants	9.0	Exercise is painful	3.4
	Children’s playgrounds	5.2	Lack of support from family or friends	0.9

Table 4: Order of Significance of Facilitators and Barriers on Residents from Highest to Lowest

The barriers that have the highest significance is the “congestions and crowdedness of streets”. This is because crowdedness causes alot of noise and car fumes, and therefore stress and discomfort. All that repels

people from any kind of physical activity. “Lack of time” is the second barrier. It was mentioned earlier (in part 1) that 45% of respondents chose it as one of the main reasons that is preventing them from doing physical activity regularly. This is due to the pressure and long hours that residents spend at work, also some people do more than one job in order to enhance their economic status. Thus, they have no time for any physical activity. “Pollution” is the third barrier, and it is resulted from crowdedness and congestion of cars that already has the highest influence as a barrier.

4.2 Survey II - International Physical Activity Questionnaire – Long Form (IPAQ-LF)

After collecting and calculating the weekly physical activity of the respondents, it is found that 52% of the respondents are “Highly active”. This result was expected because most of the respondents (41%) were aged from 31 -40 years. 32% of the respondents are “moderately active” and 13% were “inactive”. The study explored the distribution of the respondents’ weekly physical activity in each of the 3 domains mentioned in IPAQ-LF (work physical activity– transportation physical activity– recreation and leisure physical activity), Each of the domains was divided into males and females for further analysis (Figure 2).

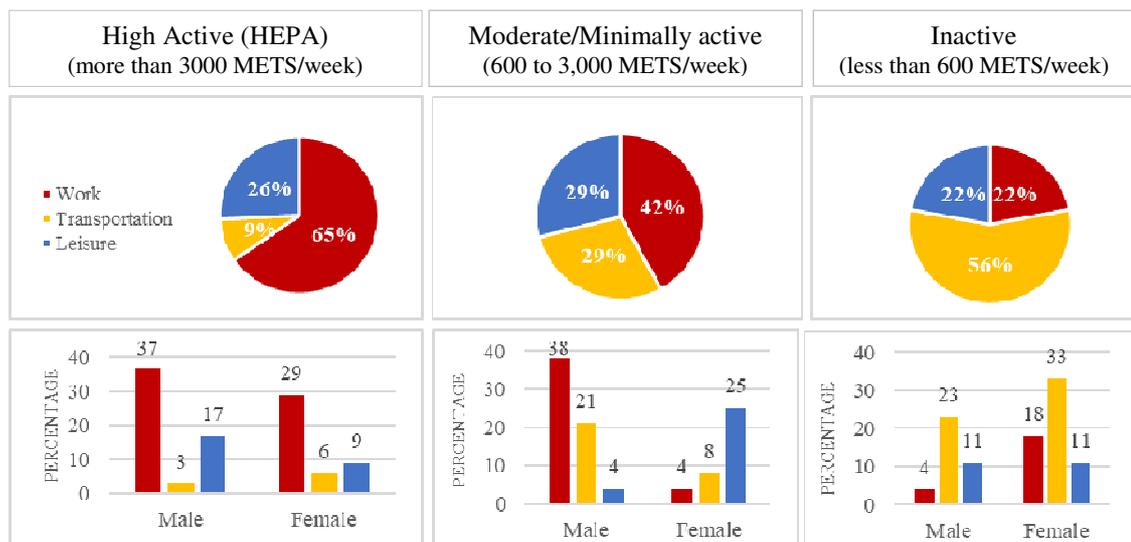


Fig. 13: Physical Activity Distributed on the 3 Domains of IPAQ-LF

From Figure 13, it is shown that most of the physical activity of the “Highly active” respondents are carried out during work by 65%, and the physical activity of males are slightly higher than females (37% and 29% respectively). In addition, the physical activity carried out during leisure and recreational time by 26%. Highly active males spend more time doing physical activity than females during leisure time (17% and 9% respectively) mainly because females already have other responsibilities during day time, such as taking care of children and constant housework, and so their leisure time is limited. Physical activity during transportation is the lowest for the highly active respondents (9%) because the highly active individuals pursue to be in constant movement. Males are less than females in this case, because men commute more than females.

For “Moderately” respondents, activity carried out during work also has the maximum percentage by 42% of their total physical activities. The difference in physical activity carried out between males and females during work is very noticeable (38% and 4% respectively). Physical activity carried out in leisure time and during transportation were equal for “moderate active” respondents (29%). When comparing physical activity of males and females in both types of physical activity, it was found that males spent more time in physical activity than females during transportation (21% and 8% respectively), while females spent more weekly physical activity activity than males during leisure and recreational times (25% and 4% respectively).

Physical activity during transportation attained the highest percentage for the inactive respondents (56%), as they do not do any activity willingly. Percentage value of females in work physical activity are more than that of males (18% and 4% respectively) and also in transportation physical activity (33% and 23% respectively).

When comparing the order of influence of facilitators and barriers between highly active, moderate active and inactive respondents, some differences were found. Figure 3 & 4 shows these differences in the order of significance in percentages.

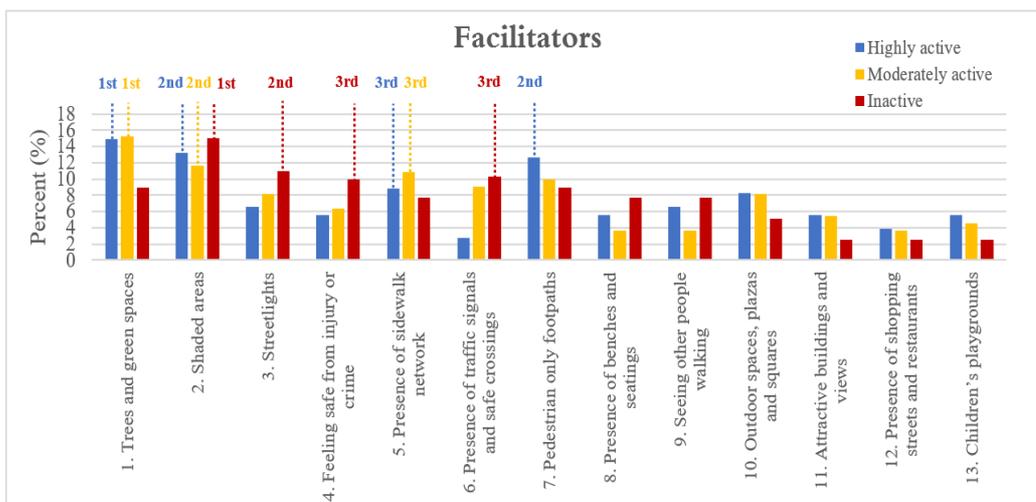


Fig. 14: Order of Significance of "Facilitators" between Highly Active, Moderately Active and Inactive Respondents.

Figure 14, shows that the order of significance of facilitators for the highly active and moderately active respondents are almost close to each other while the order is a bit different for inactive respondents. The facilitators with the highest percentage of significance is "trees and green spaces" for both, the highly active and moderately active respondents. "Shaded areas" received the highest percentage of significance for the inactive respondents, while it is second highest significant facilitator for the highly active and the moderate active respondents. "Pedestrian only footpaths" is also the second in order of significance for the moderate active respondents since people seek to walk around securely. "streetlights" is the second highest significance for the inactive respondents. "Presence of sidewalk network" is the third in the order of significance for the highly active and the moderate active respondents due to the ability of walking comfortably and safely. "Feeling safe from injury or crime" and "Presence of traffic signals and safe crossing" had the third significance for inactive respondents due to the associated sense of safety.

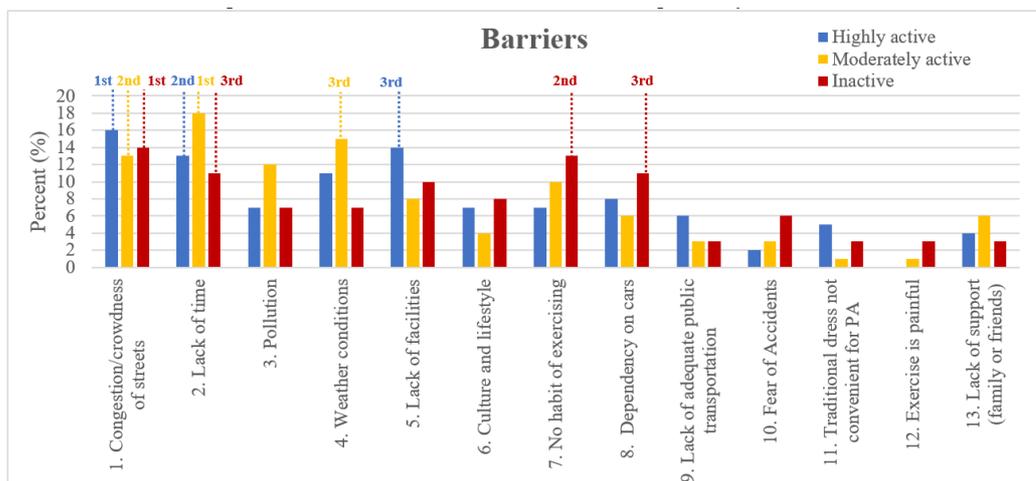


Fig. 15: Order of Significance of "Barriers" between Highly Active, Moderately Active and Inactive Respondents.

Figure 15 indicates that the barrier that has the highest percentage of significance from engaging in physical activity was "Congestion and crowdedness of streets" for both highly active and inactive respondents, it is the second in order for the moderately active respondents. "Lack of time" is from the significant barriers for the three types of respondents, due to long hours of work for residents and other responsibilities. It is the highest in significance for the moderately active respondents, second in order of significance for the highly active and the third in order for the inactive respondents. "No habit of exercising" is the second highest significance for the inactive respondents One of the main sociocultural reasons for that is because most of the parents concentrate on their children's educational studies and neglect their participation in regular physical

activity. "Lack of facilities" is the third in the order of significance for the highly active respondents, because availability of facilities is essential for their regular physical activity. "Weather conditions" is the third in the order of significance for the moderately active respondents, where good weather conditions give a push for physical activity in leisure time. "Dependency on cars" plays an important role for the inactive respondents because they mostly have no time to do any physical activity and so they do most of not all their chores using cars.

5 CONCLUSION AND RECOMMENDATIONS

The results of this paper indicated that walking decision depends mostly on urban motivations, and that urban determinants and built environment features affect physical activity of people both positively and negatively. It also shows that streets design parameters shape residents' behaviour as they need to experience pleasure while commuting such as good scenarios, natural views, the presence of open and green spaces, network of sidewalks with no obstacles. Residents also seek to avoid any stressful factors such as crowdedness of streets, pollution and vandalism.

There are several features that act either as facilitators that induce individual's physical activity or barriers that hinders individuals from engaging in physical activity and become more dependent on motorized transportation.

Conclusions of this study were found to be in line with most of the studies related to physical activity and its relation to urban determinants. Several recommendations are produced, and are directed to decision makers in local government. It is recommended to:

- Consider highly open and green areas, as it has the highest influence as a facilitator for engaging in physical activity.
- Maintain the existing open areas with green spaces, and other shaded areas with trees to lower the temperature and provide a good surrounding atmosphere for residents and thus induce the physical activity of residents.
- Maintain street lights to enhance the feeling of safety while walking particularly in quiet places.
- Construct and maintain sidewalk network to provide the pedestrians with space to walk and enjoy moving freely and safely.
- Pay more attention to sidewalks to be well paved, with no obstacles on it and provide pedestrian footpaths or sidewalk networks for increasing physical activity in the streets.
- Consider highly the problem of vandalism that are invading the sidewalks. Once the sidewalks become walkable, it will attract residents to walk more often
- Increase public transportation to motivate people to use them more and increase their activity routine.
- Install bike lanes to help increasing physical activity, especially among youth. This will avoid risky situations of cycling in the crowded streets of Alexandria city.

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