

# The Restorative Effect of Well-Designed Open Space on the Physiological Health of the Obese Adults in Saudi Arabia

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*Abstract It has been found that the restorative environment literature heavily focused on the relationship between experiencing open spaces and psychological health. Yet, the effect of open spaces on physiological health and wellbeing did not received similar attentions. According to World Health Organization, obesity and its related diseases become a critical physiological health issue, especially in Saudi Arabia. Saudi citizens have been recorded among the highest in obesity. This highlights the need of strategies that involve open spaces to control the prevalence of obesity and improve the human physiological health. Thus, this study attempts to identify the physiological restorative effect of open spaces on the obese adult males before and after engaging in physical activities by measuring the changes in the glucose level in the blood and the blood pressure, in the city of Yanbu Alsenayah, which is a well-designed city in Saudi Arabia. The data was collected over five days by monitoring the glucose level, blood pressure level, and heartbeat rate of 38 obese adult males before and after the usage of open spaces. The collected data was analyzed by using SPSS Version 24. The results suggest that there are differences in the readings of the glucose level and blood pressure of the respondents. It indicates that engaging in physical activities in well-designed open spaces, controls obesity and related diseases. Also, it suggests that the design and the facilities at well-designed open spaces attract and motivate the users to be physically active which improve the weight loss.*

*Index Terms: restorative Env, obesity, open space , well-designed cities,health*

## I. INTRODUCTION

The relationship between experiencing open spaces and psychological health has previously studied intensely in restorative environment literature. However, the effect of open spaces on physiological health and well-being did not take similar attention. In the 21st century, many discoveries occurred about the obesity, one of the most significant was the link between the cardiovascular disease and weight loss. Countless studies suggested that the changes in the people live style affected their health and well-being. One of these studies concluded that many factors are substituted to increase the occurrence of obesity in the worldwide. Importantly, how the lifestyle changed, which are allied with cumulative of urbanization [29].

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## II. PROBLEM STATEMENT

The past studies have concluded that the environment supports the restoration effect. The studies have focused on the measurement of the outcomes of experiencing natural environment such as reducing stress and restoration from attention fatigue. One of the examples is the positive effect on the perceived stress relief to built environment after a visit to the natural area for a short period of time [4]-[10].

In the 21<sup>st</sup> century, obesity and related diseases is seen as one of the leading health problems. Diabetes is one such obesity related disease, which is caused due to obesity. Similarly, hypertension and other cardio vascular diseases also may arise due to obesity [41]-[43]. As per a report from WHO, in 2014 more than 600 million people above the age of 17 years have obesity or obesity related diseases. Thirteen percentage of the world population was said to be obese in the year 2014. According to WHO, "obesity is the accumulation of an abnormal amount of fat, and it is measured by body mass index (BMI), which is the weight in kilos divided by height in meter<sup>2</sup>". Obesity leads to many diseases such as cardiovascular diseases and type two diabetes (T2D) [41]-[45].

Among many different findings related to obesity in the 21<sup>st</sup> century, one of the most important finding is Sicree and Shaw (2007) [29] identification of the link between obesity related diseases and the weight loss. One of the keys to avoid obesity and obesity related diseases is to find a way to lose weight. The weight loss will help in controlling the glucose level in blood and will cure T2D. In today's life style people have minimum mobility in their daily life, this has affected their life style, health and wellbeing. In the urban lifestyle, people travel by vehicles, consume a lot of junk food and have very less mobility, this is leading to obesity. The study concluded that there many different reasons for the increase in obesity, one of the main reason is the urbanization which has led to a change in lifestyle [29]. Most of the health problems and chronic diseases found in people living in Arab towns such as diabetes, hypertension, and high cholesterol can be attributed to bad urban planning, which have led to a change in the lifestyle of the population. The lifestyle of the people these days have become more dependent on machines, and people are more physically inactive. Thus, physical activities can help people to lose weight by exercising, walking, jogging and



swimming. However, this type of activities may happen either in gymnasiums or at open spaces if this open space has the facilities.

According to WHO, by 2025 the number of people diagnosed with T2D will reach 200-300 million [17]. Hypertension and T2D occur more frequently in obese adults than in lean people at almost every age. Weight loss is effective in reducing obesity and its related diseases. Since obesity is an increase in body weight, which means an increase in body mass index BMI, losing weight is the first step to stop obesity and prevent its related diseases. T2D risk, which is considered one of the obesity diseases, is linked roughly to two factors; environmental exposure and genetics [17]. How is environmental exposure related to T2D? It is suggested that sedentary lifestyle plays a vital role in obesity prevalence. Environmental exposure means visiting urban parks and outdoor open spaces, thereby could encouraging people to be physically active. For example, exercising, jogging, walking, and swimming. All these activities could occur in open spaces.

Overweight happens more often because of an inactive lifestyle. Besides, physical inactivity has been identified as a risk factor for obesity and its related disease, which are T2D, Hypertension, and cardiovascular diseases [17]. As a result, physical inactivity leads to obesity, which has affected people around the world. Therefore, to be physically active means being healthier. According to WHO, all body movement performed by muscles requires the expenditure of energy, for example, walking, cycling, or participating in sports is usually defined as physical activity. This activity can occur at open spaces in urban areas. In Yanbu, the open spaces that provide space for physical activity are waterfront and neighborhood parks. Physical activity for an adult on a regular daily basis could reduce the risk of T2D by 20 to 60 percent [17]

Moreover, most of the prevention programs for T2D require that people change their lifestyle. Thus, inserting physical activity into the daily schedule of the people who live in an urban context, especially obese adults, could prevent the obesity and its consequences. Aforementioned study indicates how beneficial physical activity like exercising helps in losing weight and preventing T2D. In 2010, adults aged 20-79 diagnosed with T2D numbered 285 million and will increase to 439 million by 2030, globally [29]

This study investigates the relationship between physical activity performed by obese adults and reduction of obesity in certain types of open spaces. The study was held in Saudi Arabia at one of the well-planned cities along the coast of the Red Sea. This city, which is known in Arabic as Madinat Yanbu Asenayah (MYAS), is the industrial city of Yanbu. It is located 350 kilometers north-west of Jeddah in Al Madinah province of western Saudi Arabia (see maps below). Industrial Yanbu is a major Red Sea port and was established in 1977, and it is still under development. It was designed and planned by Parsons Cooperation and is currently managed by the Royal Commission of Jubail and Yanbu.

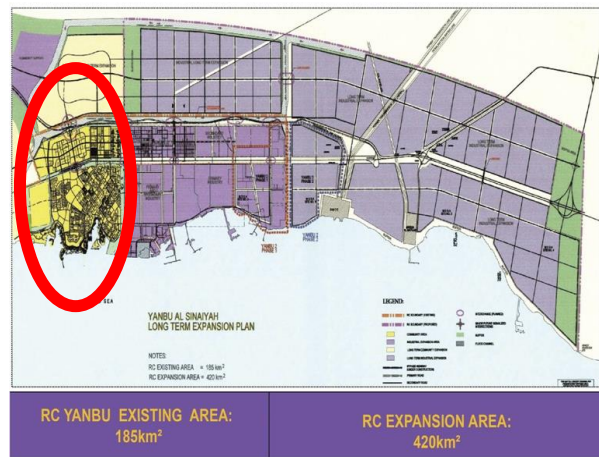


Fig. 1: Site Location (Al-sinayiah 2014)

MYAS community area occupies 5,587 hectare, in which 1450 hectare of the community is subdivided into twenty-three districts which can accommodate 96,000 people (Al-sinayiah 2014). Moreover, the length of the waterfront of the city is eleven kilometers, the smallest width is 20 m, and the widest width is 250 m, and its area is 420 hectare. The community has twenty-five different parks spread within the city.

### III. LITERATURE REVIEW

Urban parks are defined as open space areas reserved for the public and mostly dominated by vegetation and water. In MYAS, waterfront parks and neighborhood parks are the open spaces provided by The Royal Commission for Jubail and Yanbu (RCJY). Possibly, engagement in physical activities in both parks can reduce stress and obesity. This engagement can lead to reducing the risk of diabetes, Hypertension, and cardiovascular disease. Four different disciplines conducted studies discussing obesity and its related disease interaction with physical activity including medical, environmental psychology, urban design, landscape architecture, and community design.

In 2014, 600 million adults 18 years and older were obese around the world. This shows how serious this health issue has become. What are the reasons behind this phenomenon? It is proposed that sedentary lifestyle and eating junk food are behind the obesity prevalence. Obesity has other effects that consequentially occur with its appearance. These effects, which are called obesity related disease, include diseases such as T2D, hypertension, cardiovascular diseases. However, many medical studies analyzed the obesity problem to stop its rapid spread. These studies suggested preventive strategies that can stop obesity and its related diseases. Two main strategies are improving physical activity as a daily routine and fixing the daily diet. This study focused on improving physical activity.

Studies in urban design and landscape architecture suggested that open space promotes physical activeness. Since this study is examining the restorative effect of open spaces, it is necessary to show how the previous study



presented the relationship between physical activity and obesity and its related diseases.

Consequently, losing weight is the logical reaction. However, what about the obesity related diseases? How does physical activity affect diabetes, hypertension, and cardiovascular disease? Medical studies discussed the benefit of routine physical activity on the obesity related diseases. These physical activities such as walking, jogging, and exercising can be done in open space in MYAS.

T2D is one of the obesity related diseases, and globally it has become one of the most prevalent diseases. Diabetes has two types, and the focus of this study is type 2. T2D is defined as the condition when the body cannot use the insulin hormone efficiently, which causes the increasing of the glucose concentration level in the blood. The glucose level in the blood should be less than 100 mg/dl for a normal person, 100-125 mg/dl is considered prediabetes, and 126 mg/dl or higher is considered diabetes. Thus, to measure the effect of physical activity on the diabetic person, the glucose level should be monitored.

Saudi Arabia was ranked sixth in diabetes prevalence in 2011. This percentage shows the seriousness of this problem of diabetes as well as obesity in Saudi Arabia. It has been suggested that to prevent T2D; lifestyle must be changed by becoming more physically active, which could happen at open spaces such as neighborhood parks and waterfront parks. Thus, being physically active affects diabetes, and this is the restorative effect the study is going to measure. As a result, physical activity affects obesity in two different ways, losing weight and controlling one of the related diseases, which is T2D. Losing seven percent of the body weight and moderate exercising for 30 minutes five days a week could reduce the risk of T2D by 58 percent. Therefore, the commitment of keeping physically active on a daily basis gives an image of how crucial physical activity is for urban people. Another study also suggested that 150 min/week of leisure-time physical activity, which is considered moderate, reduced the risk of diabetes by 36 percent. This study could help to show how beneficial physical activity is in the reduction of diabetes and obesity. However, another study suggests that high-intensity physical activity helps to control the glucose level in the blood in T2D diagnosed people (Adams, 2013). This information raises the question that how moderate high or low-intensity exercise determined?

There are two different methods to measure physical activity intensity, subjective and objective. First, the subjective method to draw an assessment of the intensity using questionnaires and diaries (Strath et al., 2013). It is possible that these two ways may not be accurate for this study, because the time frame is short and the data will be self-reported. The objective method, in contrast, has many categories, namely: Measuring the expenditure of energy: it measures the calorimetry or how many calories has been used during this activity. Motion sensors: this method counts how many steps the user moved, which then determines the distance covered. Physiological measures: such as heart rate monitoring. According to the American Heart Association, exercise is considered moderate if the

heart rate reached 50-69 percent of the person's maximum heart rate, and high if it reached 70-89 percent as shown in Table 1.

This method is more suitable for this study because the collected data will be more accurate since it is automated. It depends on the different type of gadgets that count the heart rate and energy amount that determines the intensity of the physical activity. There are gadgets which combine two or three assessment methods that could be used in the study. In previous studies, gadgets such as accelerometer and pedometer were used to measure motion. Smart watches such as Apple watch could measure average heart rate, calories, and distance and this could be used in data collection. It is evident from the previous studies; how much physical activity is beneficial to the obese adults who were diagnosed with T2D.

Furthermore, it shows how the intensity of the physical activity plays a role in how it is effective in controlling diabetes. The second obesity related disease is hypertension. Hypertension is the condition that occurs when the blood pressure continuously rises, causing increased stress on the vessels. Blood level readings are essential to understanding, to figure out what is considered high and what is not. If it below 120/80 it is normal more than these reading is considered hypertension.

It is shown in previous studies, that Hypertension is more prevalent among obese and overweight people than normal people. Many studies have examined the relationship between physical activity and blood pressure. In older women, habitual physical activity is associated with the decline in blood pressure level. Does this effect apply to men as well? Another study which has been conducted in Cameroon concluded that obesity, diabetes, and hypertension are more prevalent in urban areas than rural areas. This study suggest that this prevalent is affected by physical activity, however, it is not significant for women. Another study suggested that the intensity of the physical activity plays a role in controlling hypertension. Possibly, the intensity of the physical activity is what made this opposing argument, and this study argument could solve this if the intensity has been measured. Another study raised disagreement, suggesting that blood pressure is only associated with BMI, not with smoking or with physical activity status (Papathanasiou et al., 2014). Thus, there are different sides to this issue, but what all sides agreed on is the relationship between blood pressure and obesity. As a result, reducing obesity helps in preventing hypertension, which is considered a restorative because of being physically active in outdoor spaces. In Yanbu, 20 percent of the residential area is green spaces (Al-sinayiah, 2014), and because Yanbu is a well-designed city, this study was conducted there.

The third obesity related disease is the cardiovascular disease (CVD). It is a condition that affects heart and blood vessels including the failure of delivering blood to the body parts such as brain and heart muscle (WHO, 2015a). This disease is the result of being obese, which leads to the increased glucose level in the blood and unstable blood



pressure (American Diabetes Association, 2016; Whiting et al., 2011). Thus, cardiovascular diseases occur as the result of obesity, and the other two related diseases increase the risk of its occurring. As a result, preventing obesity causes a reduction of T2D and hypertension, consequentially reducing the risk of CVD.

In sum, habitual moderate physical activity causes a reduction in the prevalence of obesity. Thus, it will cause to prevent the occurrence of T2D, Hypertension, and cardiovascular diseases.

As discussed in the medical field, the ultimate goal is the enhancing of the physical activity of obese people. What are the keywords within the environmental psychology to achieve this goal? It is suggested that people who live in cities along water have an attachment to the spaces along the water (Völker & Kistemann, 2013). As a result, spaces along water attract the people to spend their leisure time at waterfronts. Thus, waterfront parks have the potential to be a restorative environment for obese adults. Besides, there are many possible physical activities a user could do while they are experiencing the spaces at the waterfronts such as jogging, swimming, and working-out (Völker & Kistemann 2011b; Doherty et al. 2014). It has been found that people who live close to the coast are usually more physically active (Giles-Corti & Donovan 2002). In sum, it can be assumed that availability of waterfronts in cities has a restorative effect on the residents. Thus, the preference for outdoor space can encourage people to use it in their leisure time.

Yanbu is a well-planned coastal city, and from the author's experience, the people use the waterfront parks for recreation. The author was working as a landscape architect in the division of operation and maintenance in MYAS, responsible for the landscaping O&M at the residential area. Furthermore, outdoor spaces help people to be more physically active, which sometimes depends on design, mentality, and the distance (Herzog et al. 2003; Giles-Corti & Donovan 2002). Thus, how attractive the park plays a role in encouraging people to engage. Since Yanbu is following standards in designing open space, the possibility of quality parks in Yanbu is good because it is a well-designed city. However, the obese adult's opinion, which was collected in this study, may clarify which space is more preferred, waterfront parks or neighborhood parks and why. As a result, the preference and attractiveness are the factors that control the eagerness of obese adults to be more physically active at outdoor parks. These two factors will help to show which space is helping the obese adults to be more active, which means more restorative effect from the outdoor spaces. In this study, the restorative effect is controlling glucose level in the blood, lowering blood pressure and losing weight.

In landscape architecture, urban design and community design, obesity has been discussed in relation with the built environment. The scale which has been discussed varied in every study. For example, in community design, every hour of using vehicle per day increases the risk of the obesity by 6 percent (Frank et al., 2004). Thus, new lifestyle that depends on vehicles for transportation is increasing the

possibility of obesity, which is happening in MYAS (Zawawi, 2013). The design influences to promote physical activity in daily life and leisure time by enhancing the walkability of the environment (Abraham et al., 2010). Walkability is the most often mentioned word because it affects peoples' health. For each kilometer of walking, the obesity risk reduced by 4.8 percent (Frank et al., 2004). This relation raises the question, "why don't people walk?" Another study suggested that the land use design plays a role, the accessibility to open spaces improving peoples' health (Sandifer, Sutton-Grier, & Ward, 2015). In MYAS, there is 14 square kilometer of green open spaces (Al-sinayiah, 2014). Thus, the amount of green open spaces provide good accessibility for the residents for physical activity. Therefore, in landscape architecture scale, the availability of open spaces system in Yanbu could encourage people to walk more. Other aspects also discussed included well-designed landscape spaces attracting people (Abraham et al., 2010), and that helps people to be more active by providing walkways, pedestrian zone, and cycling tracks. MYAS was designed and planned by American cooperation with experience in this area, which is Parsons Cooperation (Zawawi, 2013). This cooperation is still working as a consultant with RCJY until the present time. MYAS has received the third place prize in the Arab Cities Organization landscaping competition in 2013 (Al-sinayiah, 2014). As a result, Yanbu is a well-designed city and has high quality green open spaces.

The most important keywords in the community design, landscape architecture, and urban design are walkability and reducing the use of vehicles. Another study contradicts this idea by suggesting that there is no relation between park use and physical activity (Zenk et al., 2011). Therefore, this contradiction could be solved through this study in the context of Yanbu. Accessing open spaces is essential for health, but more evidence is needed (Ward Thompson, 2011). This need states that there is a gap in the evidence which can be provided by this study. Studies about urban parks showed that people who spend time in parks are usually more physically active. For example, being in urban park encouraged the people to walk, play social games and do other physical activities (Völker & Kistemann, 2011b; Ahern, 1991; Völker & Kistemann, 2011a; Doherty et al., 2014; Abraham et al., 2010).

Moreover, to do some passive activities such as bird watching, fishing, and sitting to have physiological, psychological, and social benefits. In MYAS, people do some of these activities such as walking, jogging, fishing, and sitting at the waterfront, which called *Corniche*. In sum, because of the availability of open spaces system in Yanbu, people especially the obese adults can engage in physical and passive activities at outdoor spaces.

#### IV. METHOD

This study aims to examine the restorative effects of the urban open spaces on the city population especially the



obese adults in MAYS. It may show the link between the quality of the open spaces and the health quality of the

of Saudi Arabia. Therefore, it investigated the physical activeness of the users while they are at urban open spaces. The data in this study was obtained through physical check-up: to build a quantitative data set that can help in distinguishing the relationship of experiencing urban open spaces with the physiological health and well-being. The targeted measurements were blood sugar, blood pressure, and heartbeat rate. These measurements helped to link the physical activities to the health and well-being of the obese adults. Medical professional help needed at this stage. The author went to one of the public hospitals to take a short course in taking the readings of glucose level in the blood and blood pressure and its principles.

The study will compare the collected data from two urban spaces in a well-planned city in Saudi Arabia. This city is Madinat Yanbu Alsenayah (MYAS). The first space is the waterfront of MYAS, and the second space is a neighborhood park in the city. These two spaces have the same design theme, which is a curvilinear walkway that could be used for exercising.

Research Methods

This research will involve the preparation of an experimental study. An experimental study is to look at the possible factors that could cause or influence a specific condition or phenomenon (Leedy & Ormrod, 2013). It means that this study will examine the influence of being physically active at outdoor spaces on obese adults by measuring the change in the glucose level in the blood and the blood pressure. This research focused on the obese adult resident's experience of the current open spaces in MYAS. The parameters that will be measured in this study are (1) blood pressure (BP), (2) blood glucose level (BG), (3) heartbeat rate (HB), this set of data shows the effect of experiencing urban open spaces on the obese adults.

The spaces which will be used for collecting the data at MYAS have been chosen for the following reasons:

Both of the spaces are linear parks, both have walkway systems which could be used for exercising, designed and approved by RCYJ and has services., both of the sites are accessible by car if they live one kilometer away from the park and by walking if they live less than one kilometer. Besides, the two sites are located in two different sides of the city (see the map). As a result, if an obese adult lives in the middle of the city, they have the same chance to use any of the two sites.

t-Test: Paired Two Sample for Means

	Day 1	Day 2	Day 3	Day 4	Day 5
Mean	15.83636	13.71429	15.07143	13.28571	15.14286
Variance	40.93	34.07	40.90	34.03	40.90

	.616	.178	.337	.082	.666	.339	.386	.203	.358
Observations	17	17	17	17	17	17	17	17	17
Pearson Correlation	0.9919	0.9998	0.9706	0.9800	0.9775	0.9804	0.9836	0.9846	0.9846
Hypothesized Mean Difference	0	0	0	0	0	0	0	0	0
DF	17	17	17	17	17	17	17	17	17
t Stat	23.2435	22.9435	22.9435	22.9435	22.9435	22.9435	22.9435	22.9435	22.9435
P-value (one-tail)	0.0000055	0.0000048	0.0000055	0.0000055	0.0000055	0.0000055	0.0000055	0.0000055	0.0000055
t Critical one-tail	1.6536	1.6536	1.6536	1.6536	1.6536	1.6536	1.6536	1.6536	1.6536

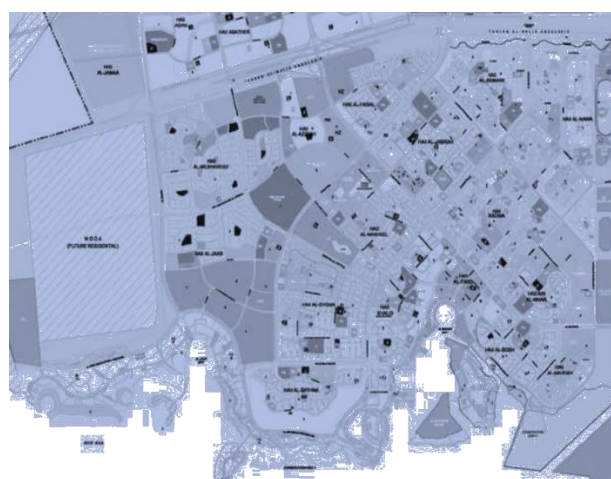


Fig. 3: Data collection Site Location (Al-sinayiah, 2014)

The test procedure is to advise each group to gather at the chosen space, either the Waterfront Park or Neighborhood Park, and they should eat two hours prior to the test time. Then, all the measurements will be taken at the site on the before and after the exercise each day for five days. The measurements that have been taken are BP, BG, and HB. Next, the respondent will start experiencing the chosen space for one hour. According to the previous studies, moderate physical activity for 30 minutes per day is minimum (Smith et al., 2016; Zethelius et al., 2014, Alsolami & Embi, 2018). However, due to the author's experience as a type 2 diabetic patient, 40-60 minutes is beneficial to control the glucose level. This single hour will be called the test stage. During the test stage, the participant was observed by wearing a smartwatch which recorded the participants' average heart rate, energy expenditure, where were they during this hour by GPS and steps count. They will receive a short message via SMS to inform them that



the time is up. Then, the respondents will gather at one spot, where they will be provided with water and rest for 15 minutes. The three variables will then be measured again. This stage will be called post-test stage. This procedure will be repeated for five days in each park to monitor the gradual results, and to investigate if there any differences between the spaces in terms of commitment. The researcher has recruited 38 participants each site had 19 participants for five days.

**V. DATA ANALYSIS**

The data were analyzed in two different ways. The glucose differences tested by using the T-test for the mean value of glucose level in the blood of the difference before and after the exercise. Besides, the blood pressure was tested by how often do the respondents' blood pressure improved after the workout.

**1. Glucose Level**

**2. Blood Pressure**

	Subjects number	Showed improvement	Did not show improvement	percentage
Day 1	38	19	19	50%
Day 2	38	18	20	47%
Day 3	38	20	18	52%
Day 4	38	20	18	52%
Day 5	38	20	18	52%

**VI. DISCUSSION**

A paired-samples t-test was conducted to compare the glucose level in the blood before and after exercising in open spaces. There was a significant difference in the scores for glucose differences before exercise ranged (M=155-158, SD=1.14) and after exercise (M=134-133, SD=1.14) conditions; (t(175)=23.243, p =1.09E-55) to (t(175)=23.049, p = 3.31E-55) (see the table above). These results suggest that glucose level in the blood really goes down after exercise. Specifically, our results suggest that when obese adult engage in moderate physical activity for one hour, the glucose level in the blood decreases. Consequentially, the exercise reduced the glucose level each day. After analyzing, since the P. value one tail is less than 0.05 H<sub>0</sub> should be rejected upon examining the mean before exercise, and after exercise, it is clearly shown that before exercising mean values of the glucose is greater than the mean values after exercise. This difference is indicating that there is a significant reduction in the glucose level in the blood after the exercise. The effect of physical activity on the blood glucose level happen because physical activity makes the body more sensitive to insulin which can lower the blood glucose up to 24 hours or more after the workout (ADA, 2017). In this case, all the respondent were informed to keep their heart rate in the moderate zone as much as they can by monitoring their smartwatch. This case study was limited to monitoring the effect of the physical activity without controlling the respondent diet. It shows improvement in the glucose level during the five

days of the test. It might have shown better results if the respondents were following a healthier diet plan. They were advised to be more responsible in what they eat, but not all of the respondent were following the instructions regarding the diet.

Besides, more than 50% of the respondents showed improvement in the blood pressure readings after the same exercise which indicates that the engagement in physical activity at open spaces benefited the obese adult's respondents in improving their readings of the blood pressure and glucose level.

The scenario of this study might not go the same way in any different city in Saudi Arabia, because of the design of the spaces in the studied city is what motivates the users to come and visit the space and get engaged in physical activity there. One of the respondents mentioned that he is originally from another city in Saudi Arabia when he is on vacation in his original town he is not active in comparison to the days he is in MAYS. The reason was even there are spaces with walkways in his city, but still, it does not have the same facilities such as bathrooms, prayer space, shade trees, and the materials of the walkway. This comment leads to the point that the design of the space affects the users to be more active. On the other hand, it raises a question what are the characteristics or the criteria of the comparison.

According to the author's previous experience as a landscape architect, there are some differences between this space in MAYS and other spaces in other cities in term of design, safety, facilities and greenery coverage.

The illustrations Figure 4 and 5 show a comparison between two open spaces on in MAYS and the other one in Jeddah. It shows the difference between the two spaces. The differences could be seen in terms of the design and safety. In term of design the space in MAYS give the users more enclosure space by the amount of the trees provided in the park and the short distance between the trees. In the other hand, the amount of the trees in Jeddah is lesser and there is long distance between the trees which terminate the enclosure of the space. In term of safety, the distance in the open space in MAYS between the road and the park spaces especially the walkway by providing wide buffer zones helps the users to be more comfortable. In comparison, the distance in the park in Jeddah is short about 10 meters which affect the sense of the space.







Fig. 4: Neighborhood Park in MAYS

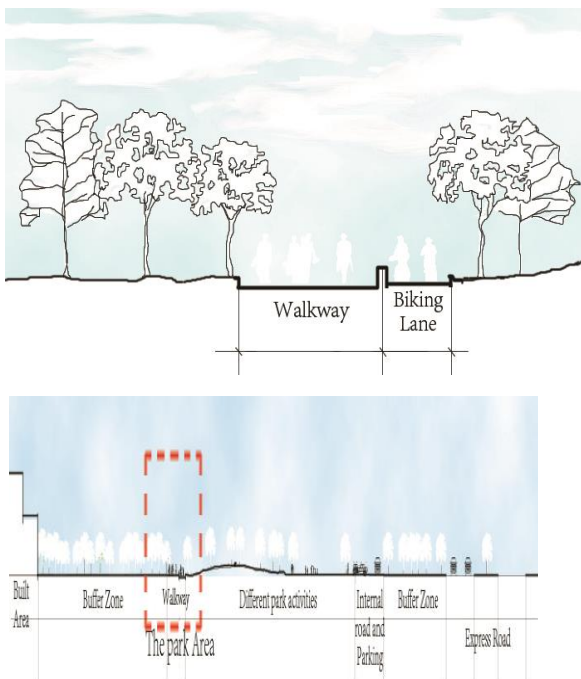


Fig. 5: Neighborhood Park in Jeddah

## VI. CONCLUSION

This experimental study has looked at the relationship between experiencing an urban open space and the physiological health of the users. The data collected by taking the readings of the glucose level and the blood pressure of the 38 obese respondents in two different urban open space in MYAS in Saudi Arabia. After analyzing the data, it shows that experiencing the open

spaces has a physiological benefit as well as psychological. The drop in the glucose level of the obese adults and the improvement of the blood pressure suggest the restorative effect of urban open spaces on the physiological health of the visitors. Besides, this physiological restorative effect leads to another benefit which is decreasing the prevalence of obesity and its related diseases. The properties and facilities, such as the designed walkways, outdoor resistance equipment, and fields, of the open spaces at MAYS, motivate the users to be physically active. This facility improves the weight loss and help to control the glucose level in the blood and the blood pressure. This suggest that the well-designed open spaces have restorative effect by motivate the users of this spaces to engage more efficiently. The only thing that needs to be known by the users of the park including obese adults is how to maintain the intensity in moderate intensity, which has been maintained and monitored by the smartwatches in this study. It is recommended to spread the knowledge among the users, either by signs which it is the designer task or by public awareness services, to help them to get the most out of them.

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