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NEW CONSIDERATIONS IN DESIGNING THE CIRCULATION ELEMENTS TO REDUCE COVID 19 INFECTION

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NEW CONSIDERATIONS IN DESIGNING THE CIRCULATION ELEMENTS TO REDUCE COVID 19 INFECTION

Abstract

As a result of the global pandemic recession of COVID-19, cities have imposed several restrictions to control this outbreak by closing their frontiers and forcing social distancing. The conjecture has arisen as to how architecture could be entirely influenced. This field is involved in finding solutions to reduce the spread of this pandemic which became a new issue. Unfortunately, due to the shortage of the movable and flexible circulation elements, the considerations and architectural preventive measures taken were affected during the planning of the post-pandemic built-environment. This paper, therefore, aims to propose a checklist of new design considerations for the circulation elements in the public buildings and the outdoor spaces. These considerations are hypothesised to reduce the possibilities of virus infection. COVID-19, thus providing necessary safety measures from virus attacks, enhancing the defence mechanism of our physical environment. Based on the desk research, this paper will highlight the previous readings. After that, the paper analyses Porto restaurant by MASS group design and Rising Together: The Black Experience with Police in America exhibition as case studies, to recognize their architectural approach concerning the flexibility and circulation, in response to the widespread of the pandemic, and how these strategies became important guidelines to be considered. In conclusion, various considerations in design are conducted in order to achieve the main aim mentioned previously involving health criteria.

Keywords

COVID-19, Circulation Elements, Consideration, Public Building, Outdoor Space, Flexibility, Adaptation

1. INTRODUCTION

Coronavirus outbreak (Covid-19) is a viral infection that led to a global pandemic of respiratory disease, identified in China. (WHO, 2020) This contagion has revived the concept of movable circulation elements through artificial environments, brought back to life in a particular location for a limited period, although its influence may proceed for a long time to come. Accordingly, new considerations in architecture have been carefully taken, one of the most common considerations is flexibility, considered as a respond to the changing circumstances. The significance of flexible design and its progress in enhancing the compatibility of dynamic interaction between proceedings, environment and function of space can be strongly outlined. Flexibility in the context of the Covid-19 outbreak determines the level to which adaptation, being an interactive and physical feature to persist, is potential. (Bettaieb, 2020) The Covid-19 pandemic has contributed to a high amount of death globally and represents a first-time challenge to public health, economy and lifestyle. It will affect all aspects of life globally. Increasingly, the impact and burden of disease beyond individual health is being considered. For this reason, architecture has recreated innovative perceptions in terms of movable circulation elements. The integration of these responsive elements is a key intervention to fight the spread of the virus. This enable the space to respond to the changes occurring in the environment. These elements enhance the theory of flexibility to adjust the built space or the potential to change it in order to fulfil new needs. Flexibility in architecture refers to the capacity of a building to constantly adjust its layout of space and even its structure to changing needs. The achievement of such architectural flexibility has been a challenge for a number of investigations over the last century. Starting from this concept in architecture, they developed movable elements to reduce the infections of Covid-19. (Bettaieb, 2020) Due to the lack of strategies and planning, with the absence of necessary movable elements, the widespread of the virus is causing record-breaking deaths and infections. Unfortunately, this pandemic has radically affected all sectors such as economy, health and recreation. Nevertheless, in architecture, the considerations and precautions taken in planning the post-pandemic built-environment, were influenced. In previous months, a new stage have been reached in life of illness and architecture, where worry of infection is once again controlling what type of space we need to get in. Closely packed spaces will no longer be as comfortable and welcoming as they raise the spread of the virus. The Coronavirus pandemic, with its laws and restrictions, had an impact on architecture. Indeed, the waste of intersections between planning, design and public health has negatively affected the lifestyle of individuals. (Chayka, 2020)

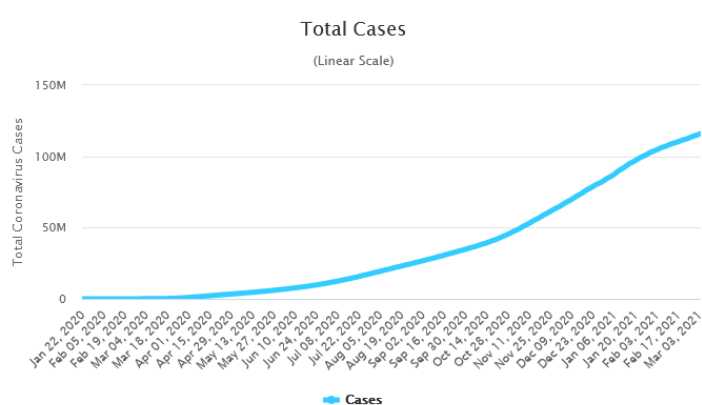


Fig.1: Graph showing the total Covid-19 cases of infection WHO (2020)

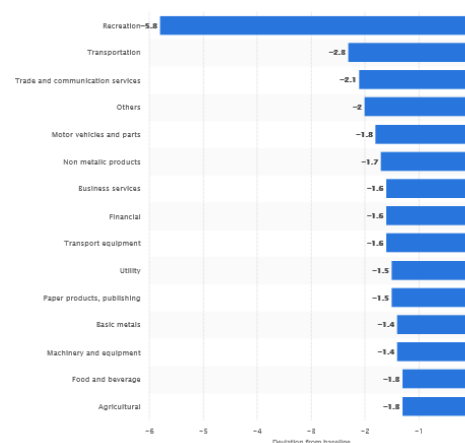


Fig.2: Graph showing the influence of Covid-19 on different sectors WHO (2020)

This paper, therefore, aims to propose fundamental and radical considerations in planning the design of the movable circulation elements in question during Covid-19. Therefore, providing innovative architectural guidelines is necessary for the adaptation of users.

The paper hypothesises that the Covid-19 pandemic has introduced new considerations and strategies of flexibility in terms of designing the movable circulation elements in architecture.

This research paper is a mixed-method type of work. It is based on inductive and analytical approaches. The analysis study of the literature review will be related to the new strategies taken into consideration in designing the flexible elements mentioned previously. Furthermore, it analyses the adaptation with the Covid-19 pandemic spreading globally. After that, the research paper will compare between the different case studies introduced in order to draw conclusions related to that matter.

2. LITERATURE REVIEW

2.1 Definitions of Covid-19 and Circulation

This part of the research is a theoretical basis which tackles definitions, types and principles regarding the new strategies in designing the circulation elements to reduce the spread of Covid-19.

According to the World Health Organization (WHO):

“Coronavirus disease (COVID 19) is an infectious disease caused by a newly discovered coronavirus.”

The World Health Organization (WHO, 2020) mentioned this definition.

Coronavirus infection 2019 (COVID-19) is considered as illness triggered by a new type of coronavirus known as severe acute respiratory symptom coronavirus 2; which used to be known as 2019-nCoV), which has since been recognized as a result of a pandemic of respiratory illness cases in Wuhan City, Hubei Province, China. It was originally reported to the World Health Organization on the 31 of December, 2019. At the end of January, 2020, the World Health Organization confirmed the COVID-19 infection an international crucial situation. On the 11 of March, 2020, the WHO announced COVID-19 a worldwide disease outbreak, the first of its kind since declaring of the H1N1 influenza virus as a global disease. (Cennimo, 2021) COVID-19 disease infects mainly via particles of body fluids or release from the nose when an individual who as caught the virus coughs or sneezes. Therefore, Social distancing (SD) has been encouraged by nations across the world as an efficient mean of stopping the transmitting sequence. Lately, the word physical distance is being boosted in place of Social Distancing, as people are able to communicate with each other on a social network. The word SD, even though adopted in the modern era, dates all the way back to the fifth century (Gupta, 2021). In the research of viral infections, the Centres for Disease Control and Prevention (2020) defines social distance as a series of methodologies for decreasing the occurrence and connectedness of people-to-people interaction in order to reduce the threat of spread of disease. (Batty, 2020)

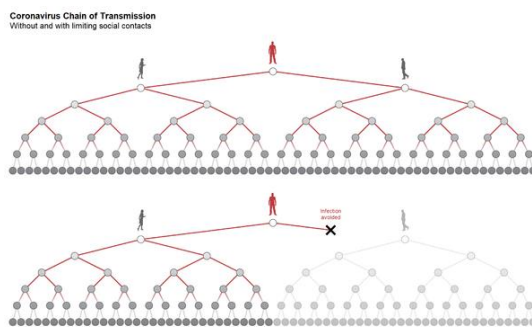


Fig.3: Corona virus transmission with and without limiting social contacts Coronavirus Protective Measures (2020)



Fig.4: Social distancing street label for awareness Neighbourhood data for social change. (n.d). KCET. (2020)

According to Francis DK Ching:

“Circulation: movement through space”

Ching in Architecture mentioned this definition: Form, Space and Order.

Circulation is seen as a clear spot of motion that link various building elements or components to a radical linkage of spaces. Creating relations between public and private spaces, circulation provides opportunities for pedestrian and vehicle access. The circulation system controls and manages movements, connects tasks together and turns the environment flexible. The idea of movement through space is one of the central themes in architectural theory, design, and practice. Circulation of system networks and dynamism between spaces – empowers and informs movements. The concept of movement is one of the key elements of theory of architecture, design and practising. Le Corbusier recommended that 'to truly understand built environment, it is essential to walk around and then through the building'. In other sayings, architectural forms and building configurations are basically demonstrated point by point. Movement may be a significant crafter of the ecosystem. And unlike other technical problems, circulation gives itself very effectively to computing. (Puusepp, 2011)

2.2 Principle Theories and Types of Circulation

Circulation is a movement of matter and energy, an organized continuity through a variety of channels. The circulation system is a combination of transaction between specialized spaces. A distinct organizational theory has been commonly detected in several stages of processes that are generally located. In the same way as a living system consisting of body parts attached by a blood vessels, a huge building comprises of different spaces linked by flow network, and a public space comprises of specialized buildings and public areas related by pedestrian and vehicle movement platforms. (Natapov, 2019). The circulation of buildings is a crucial factor for an organization of its layout and is therefore of involvement to designers and other helping professions in post-occupation analysis. The establishment of a structured process of explanation that generates a connection between the circulatory system of buildings and the complexity of tracking is a precondition for connecting circulation categories with the efficiency of tracking. And investigates innovative methods to explicitly analyse different principles. From a survey of the definitions and utilization of the term, circulation can at that point be separated into five primary classifications of progress: approach, entrance, configuration, path and form as follows:

- The building approach, identified by the distance view. There are three types of building approach; frontal, oblique and spiral. Each of them leading differently to a building
- The building entrance, from outside to inside involving the act of entering a vertical element that differentiates many spaces and segregates "here" from "there."
- Configuration of path determined by the sequence of spaces; it can be linear, radial spiral, grid network or composite. Each of them creating different modes of circulation.
- Path and space relationship; defined by either passing by the spaces, through the spaces or terminate in it. This relationship should be flexible in order to create a significant approach.
- Form of the circulation space defined by corridor, balconies, galleries, stairs, rooms and ramps (Froum, 2019)

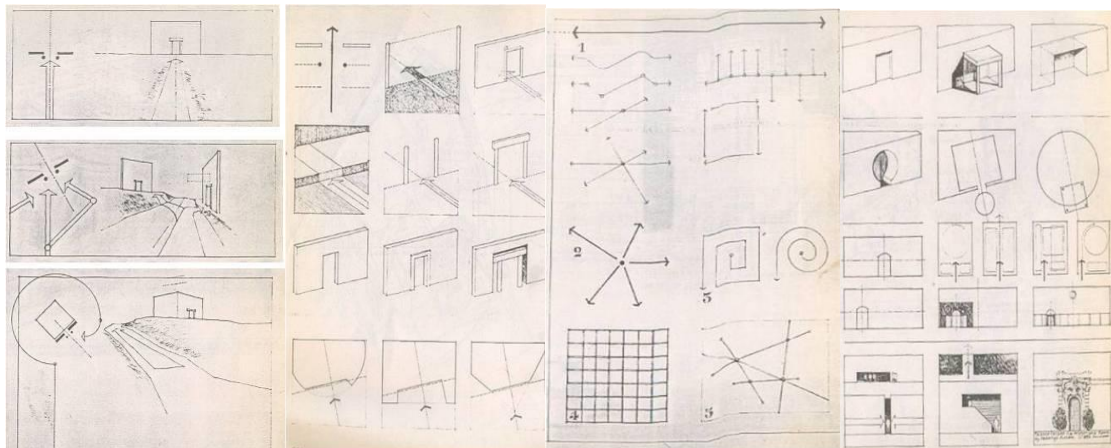


Fig.5: The circulation principles
Form, Space and Order D. K. Ching
(1979)

To optimize further, designers naturally split their reasoning into various types of circulation overlaying each other and generally organising. The type and level of these sections will actually rely on the plan, but may involve:

- Types of use defined by public or private circulation. Public circulation is the zones that will be most commonly and quickly usable. In this way, circulation often overlaps with all other activities, including the hallway, auditorium or exhibition, and is enriched to a greater extent of sense of place. Problems of accessibility, how crowds are moving, and direct escape routes are vital. Private circulation reports for more intimate activities inside the space
- Direction of movement can be horizontal or vertical. The horizontal circulation contains paths, entrances and exits, corridors. It is influenced by the configuration and distribution of furniture.
Vertical circulation consists of ramps, stairs, elevators and escalators leading us to move from a level to another
- Frequency and time of use.

Each of these categories of circulation will demand various architectural considerations. The motion may be quick or smooth, structural or manual, densely populated or personal. The paths may be smooth and winding, or tight and direct. (Hamer, 2016)

2.3 Historical Background of Circulation

Circulation started since the becoming of life and was discovered in the ecosystem concerning a scientific point of view as to which it is related to the circulation related to the organism of species. The communication between the dimension of the body parts and the network of the dwellings is in perpetual movement. Even if the humans are aware of the uninvolved nature of this system, their organs and motions are in infinite communication with our constructions. The essential connection between body shape and mobility within architecture earn the great consideration. Motion and flow have been important in the formation of an ecosystem that originated in ancient Egyptian, Greek and Roman architecture. Most of the architectural strategies used in contemporary architecture to enhance movement dates all the way back to the methodologies used in the past, such as rhythm and pattern, shade and shadow amount and expectation of the bodies within the frameworks in which humans live. (Leary, 2014)

2.3.1 Spread of Pandemic in circulation elements

The coronavirus is one of the most important global wellbeing and economic disasters in recent years of the history, and has led to record breaking death of millions around the world. The spread of covid-19 occurs through the transmission of pulmonary air droplets, as one of the most dangerous mechanism causing this fast spread between people. When a person which has the virus detected, respiring, coughing, or sneezing, millions of contaminated saliva droplets are drive out into the surrounded spaces to contaminate other persons. the most common places where the virus has higher risk of infecting an individual is in confined and enclosed spaces such as elevators, stairs, escalators, corridors, ... (Drikakis, 2021)

2.4 Previous Readings

Many readings from different books underline the concept of circulation in architecture and its transition according to the human needs and developed technology. These books and their main topics about the circulation are mentioned below:

According to “Designing Circulation Areas (July11, 2013)”, the author Schittich talks about the importance of trying to make building elements and spaces usable both horizontally and vertically while having taken into consideration a large range of criteria. That is why the new conceptions of this given process by architects, who see it as the visible signs of their theories, likely to result in remarkable yet captivating spatial configurations, were much more impressive. (Scgittich, 2013)

According to “Cities and Communities beyond Covid-19: How Local Leadership Can Change Our Future for the better” (October 16, 2020), the author Hambleton talks about the impact of COVID-19 on the world and it is commonly recognized that there could be no come back to the pre-pandemic community of 2019. Even so, many recommendations for the maintenance of humanity and the biosphere are directed at member states, international organisations and community in general. Attempting to draw on a series of studies by globally known experts, this book is based on how urban environments can respond to the manner in improving healing interventions that enhance socioeconomic, and environmental equality. (Hambleton, 2020)

According to “The Art of Experiment: Post-pandemic Knowledge Practices for 21st Century Architecture and Design” (December 21, 2020), the authors, Hughes and Armstrong are searching for new design strategies that can help us bring the people back to life. The author takes the reader on a journey through time, from the ancient past to the imagined coming years. Four major stages in the form of knowledge are defined: substance, improving, reorganizing and broadening, which are illustrated by studies related to architecture and design that take the shape of international experimentation. (Hughes and Armstrong, 2020)

According to one of the articles under the title of “Linking building-circulation typology and way finding: design, spatial analysis, and anticipated wayfinding difficulty of circulation Type” in the “Architectural Science Review” journal listed in Scimago on October 21, 2019 the authors talked about the spatial configuration, the circulation, the wayfinding and the different types of movement in circulation that determine the space. (Natapov, Kulig and Dalton, 2020)

2.5 Analysing International Examples

2.5.1 “Social with distancing” Restaurant and Bar, New Delhi, India (2020)

The criteria taken into consideration is the way this example implemented solutions in terms of circulation are implemented to face the pandemic. Knowing that "social distance" is of crucial significance, our numerous living areas will face impending disaster. We name it a pre-pandemic area based on a specific concept, designed throughout and for the disease outbreak, and productive after the disease. The restaurant serves seating areas, elevated levels with new types of circulation. The ultimate objective was to design systems, both in the strictness of the suggested furniture set and in the complexities that the arrangement generates between shape and structure, between open and covered, between the disease outbreak and the natural cycle. The final result will be the social distancing by adopting new types of circulation and strategies. (Arora, 2020)



Fig. 6: Ground floor plan of the restaurant Spatial Strategies for Restaurants Top Architectural Firm | Renesa | Sanjay Arora (2021)

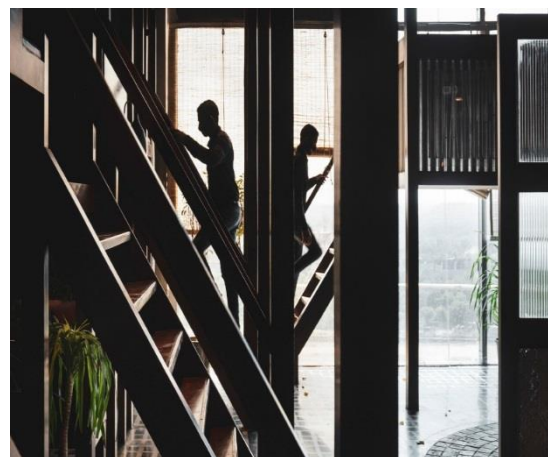


Fig. 7: Perspective showing the interior of the restaurant Spatial Strategies for Restaurants Top Architectural Firm | Renesa | Sanjay Arora (2021)

2.5.2 The Highline, New York, USA (2020)

The criteria taken into consideration is how this outdoor space implemented design and circulation design facing the outbreak. A number of environmental visuals labels have been established to allow guests securely ensure good social distances in the New York. After being shuttered over many months as a result of the disease outbreak, the elevated park officially opened to the community on July 16, 2020. 'The pattern of the circles organises the park and turns the experience of social distancing simple for guests, exhibiting them where and how to walk and wait in line as they wait to access Gansevoort,' explains the pentagram. 'The circles help users to assess the path forward and the way they must place themselves along the track when it becomes larger and tighter. (Scher, 2020)

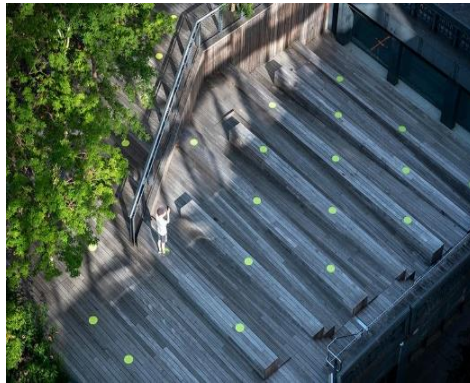


Fig.8: the pattern of environmental graphics on seating areas High Line reopening. (n.d.). Pentagram.)

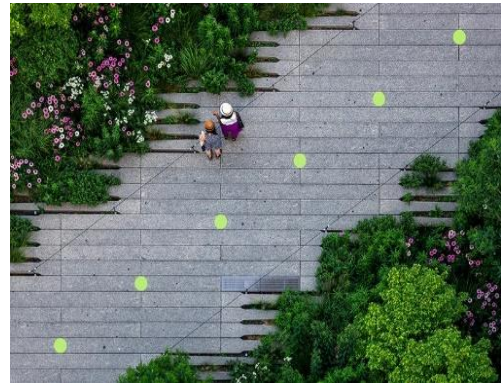


Fig.9: the pattern of environmental graphics on walkable area Source: Pentagram's High Line to promote social distancing. (2020, July 21). design boom | architecture & design magazine.

2.6 Parameters of Analysis

The literature review explores the definition and the path of circulation, how it was involved in the communities to reduce the COVID-19 infection. New strategies has been adopted in the layout of spaces defining the configuration of paths. Consequently, many parameters have been established in the design during the pandemic. Flexibility, Social distancing, Configuration of paths, Expanding spaces. The configuration of path is a significant element that will define the circulation and movement of the user, thus reaching the social distancing required. The flexibility in the movement will achieve the adaptation of the users under the circumstances and the surrounding context. Based on the precedent research, the study deducted a group of parameters to be used in the analysis of the case studies.

Table 1: the parameters of analysis

Parameters	Description
Flexibility	The ability of a space to adapt under different circumstances
Social Distancing	Required distance to reduce the spread of the coronavirus
Configuration of paths	The layout adopted regarding the circulation defined by the space components
Expanding spaces	The ability of a space to enlarge while increasing the social distancing

These parameters must be referred to when investigating the new considerations related to the circulation elements to reduce the spread of Covid-19. The following case studies justify them. For example, using new standards and guidelines in public spaces.

3. RESEARCH METHODOLOGY REFLECTING THE SUGGESTED PARAMETERS

This research is based on three research methods: the inductive method, the analytical method and the comparative analytical method. The first one was used to collect data and information concerning the selected two case studies based on a variety of references. The second one was used to deeply analyse and interpret this information through figures and essential drawings and diagrams to enhance explanations based on parameters mentioned previously in the literature review. The third method was a comparative analysis between both case studies. This comparison will be based on the study of parameters mentioned in table 2.1, to analyse the case studies and discover the common and different features between them according to the following criteria:

- Completed projects
- Diverse functions, locations and typology
- Public and outdoor projects
- Different architectural strategies to reduce covid-19 infection

3.1 Case Study One: Porto Restaurant

ID card of Porto Restaurant

- Location: Ring Road, Boston, MA
- Architect: MASS Design Group
- Date of Opening: July 2016
- Dining size: 4000 square feet
- Kitchen size: 1020 square feet
- Seating: 180; indoor, bar and patio
- Closed: March 14,2020
- Reopening: June 8.2020



Fig.10: The main dining room with views to the kitchen

Spatial Strategies for Restaurants in Response (n.d.). MASS Design Group. (2020)

Restaurants represent a serious part of the public spaces that are involved in the communication between people. There are spaces for meetings, interactions, events. In the middle of this international coronavirus disease outbreak, when the level of social space is becoming harmful and harmed, the restaurant sector's destiny is thrown into doubt, and its current trajectory remains unclear. There are no currently specific requirements or building standards initially created to react to this virus. At best, the suggestion of social distance reflects a growing comprehension of the virus's spread. Restaurants could profit from the guidelines to keep the public, the users and the employees safe. (Ritz,2020)

3.1.1 Analysing Parameter 1 in the case study I: the flexibility

One of the most important design strategies for responsive to covid-19 is the examination of spaces with a flexible reconfiguration. Create a properly specified transfer area to define the movement of foodstuffs, materials, and persons from the public sphere such as dining area and waiting area to the back of the restaurant such as the storage and the kitchen. This will aid in the development of perceptual educational achievement as well as the incorporation of new control and hygiene within the restaurant's available spaces. In this restaurant there are new recommendations for the reorganisation and movement of the employees, the visitors and the food process cycle. From these considerations, a new way of flexibility was developed between these flows. This will be in an existing space which will provide a challenge to reconfigure the space to reduce the spread of the covid-19. The exchange zones and the customers area are important to manage for a better safe place. The flexibility is available in five main zones in the restaurants respectively: The Don and the Doff zone, the loading zone, the kitchen, the exchange zone and the public area for dining. The flexibility will be determined by the reconfiguration of the space. New areas were added for the employees and the process of packaging to reduce the contact between the customers (MGD,2020)

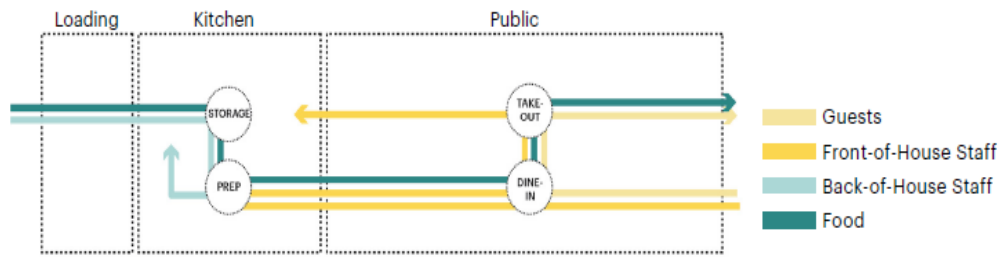


Fig.11: Diagram showing the flexibility between the different zones in the restaurant
Spatial Strategies for Restaurants in Response (n.d.). MASS Design Group. (2020)

3.1.2 Analysing Parameter 2 in the case study I: social distancing

New studies completely undermines whether distance 6 feet apart in confined area with unidentified or insufficient airflow is capable of preventing infectious diseases. The social distancing in the restaurant is a main strategy to take into consideration, with several recommendations. In this case, the tables are locating 6 feet apart, and dinners were moved to the outdoor as much as possible. Plus, the current obstacles between booths were expanded to further separate tables and reduce the contamination. When it is possible, it's important to enhance the barrier between interior and exterior seating by opening doors and trying to occupy nearby outdoor area. In social distancing, there are requirements that are taken into consideration: the types of seating, which can be adjustable or not to realise the concept of the social distancing. Porto restaurant had three types of seating: the tables, the bars, and the banquets. The tables are adaptable, flexible and can be aggregated for big groups. The bars and the high tops are difficult to adjust in such circumstances, and increase the level of the virus spread. For this reason, the restaurant was eliminating this type of seating to assure the recommended safety requirements. The banquet which are perfect for the long walls, but always providing the new guidelines. (MGD,2020)

3.1.3 Analysing Parameter 3 in the case study I: configuration of path

Porto restaurant should also consider how customers and employees will keep moving through spaces in order to create the most successful path, with respecting the government regulations. Operators must design a fluid motion that keeps people from getting near to one another. Start making one-way circulation system within the facilities as much as possible. For this reason, the restaurant was providing one-way path for each zone. New exchange zone was adopted to construct a buffer area between the public and the kitchen zone, which separate totally the private circulation from the public one. To prevent contamination, the dining area was already removed from service. The take-away delivery is actually taking place in the reception area in straight line. (Klein,2020)

3.1.4 Analysing Parameter 4 in the case study I: expanding spaces

Restaurants from all categories provide a social service for public, but it has never been more evident and obvious than during this outbreak disease, when all restaurants are working day and night under extreme stress level to supply those who heed their help and services. To preserve the public areas from contaminations, the government implement zoning legislative changes. Porto restaurant extend its space, adding seven tee square feet to its main space. They decrease the number of banquets and high-top seating and increase the number of tables, according to the right requirements of social distancing concept. (Klein,2020)

The extended patio to the restaurant changes the seating before and after covid-19 not only by the area. There is a radical transformation in the type chosen to the seating and the count.

Table 2: The seating before and after covid-19

Seating Before		Seating After	
Area + counts	Seating types	Area + counts	Seating types
4000 sf	80 banquets	4070 sf	36 banquets
180 seats	0 booth	186 seats	0 booth
110 indoor	70 table	96 indoor	150 table
70 outdoor	30 high-tops	90 outdoor	0 high-top

3.1.5 Conclusion of the case study I

After analysing the parameters of the case study one, Porto restaurant, the table 3.2 will highlight these parameters and their characteristics and descriptions. The new configurations clarify the accomplished features.

Table 3: Parameters of analysis of Case Study I

Parameters	Figures	Characteristics
Flexibility		<p>Creation of specified transfer area</p> <p>Proving exchange zone for flexibility</p> <p>Adding new zone to increase the level of flexibility between zones</p>
Social distancing		<p>Providing 6 foot apart in enclosed areas</p> <p>Enhancing barriers between internal and external seating spaces</p> <p>Considering the type of seating according to the right requirements of social distancing</p>
Configuration of path	<p>Post-COVID Capacity: arranged meals, take-out, and drive-in capacity</p> <p>Dining: 4070 sf</p> <p>Exchange: 800 sf</p> <p>Kitchen: 76 sf</p> <p># of seats: 150</p> <p>New exchange zone performs as a buffer between public and kitchen spaces adjacent to the exterior would transform to serve this function.</p> <p>Exchange zone provides seating area to make up for lost seating in the dining hall. Canteens and movable tables are used to create additional seating into cooler months.</p>	<p>The movement of the employees and the customers</p> <p>One-way circulation</p>
Expanding spaces		<p>Extending the space to the outdoor</p> <p>Adopting right seating types</p>

3.2 Case Study Two: Rising Together: The Black Experience with Police In America

ID card of Rising Together: The Black Experience with Police in America

- Location: NY, United States
- Architect: Isometric Studio
- Date of Opening: July 2,2020
- Type: exhibition
- Client: Google
- Closing: March 13,2020
- Reopening: March 12,2021



Fig.12: Interior perspective of the exhibition
Rising together: The Black experience with
police in America. (n.d.). SEGD. 2020

3.2.1 Analysing Parameter 1 in the case study II: the flexibility

Exhibitions are cultural gathering places that connect users and visitors to promote communal exchange of ideas and knowledge. Before the spread of coronavirus, exhibitions were intended to be innovative, communicating, and instructional prior. This target will not transform the main concept of these spaces, but they will need to be reconfigured with another consideration in imagination: the visitor safety will be the main goal. With reconsidering the architecture and the creativity of the exhibitions together, the rebuilt of the galleries with new strategies will create a new and better experience for the visitors. This reconsideration will start by the flexibility of the spaces and the capability of movement without any obstacle. To have a better versatility in exhibitions new floor labels can be customised with a new design and shape to define where groups can have access. The stairs are defined for one-way direction, (from up to down or vice versa). The elevators are only for the visitors than didn't have the capacity to climb the stairs. (welch,2020)

3.2.2 Analysing Parameter 2 in the case study II: social distancing

The social distancing in exhibitions is a critical point that can be a way to release nervousness and give individuals the self-confidence to walk in a safe way. To have a social distancing, there are many requirements that are adopted in this exhibition. The architects create spots that restrict the percentage of members or gatherings that can be present at any particular time. The main important point is to require 6 feet of space between non-affiliated visitors. Family members or groups of friends can start moving together with enough distance around them. (IS,2020)

3.2.3 Analysing Parameter 3 in the case study II: configuration of path

The circulation in the exhibition should be always a one-way circulation with a unique configuration of path very clear and accessible. The floor labels are recommended to define the path of the visitors and encouraging the single direction of movement. The galleries are divided by specific zones which accept a limited number of groups and persons. The unused corridors are reopened for the flow of guests. The separate circulation of entrance and exits are necessary to avoid contact and reduce the spread of covid-19. The paths are in a direct relation with the zoning of plan, the layout of flow and the starting and ending point. (IS,2020)

3.2.4 Analysing Parameter 4 in the case study II: expanding spaces

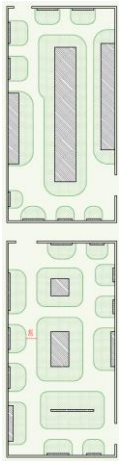
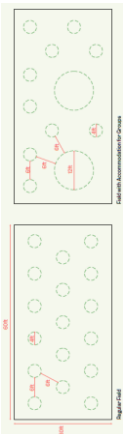
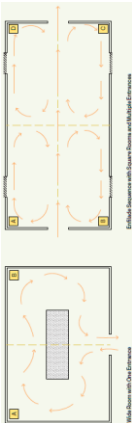
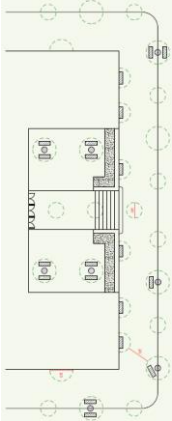
During the disease outbreak, many persons have turned to the outdoor area for comfort and relaxation, and exhibitions have a chance to move to the open-air space. With restricted interior potential, carefully designed exterior galleries could offer guests with an innovative user experience. The control in outdoor exhibits is less than the interior one. The people feel freer in the open-air and the spread of the virus is less in these spaces. The expanding spaces need also efficient requirements, or the feeling of visitors will transform

this outdoor exhibition to an environment of contamination. In this case, the entry and the entrance should be clear and well mentioned. The distance between visitors is 6 feet apart with providing outdoor seating and benches, and the viewing zones should be well clear. (Klein,2020)

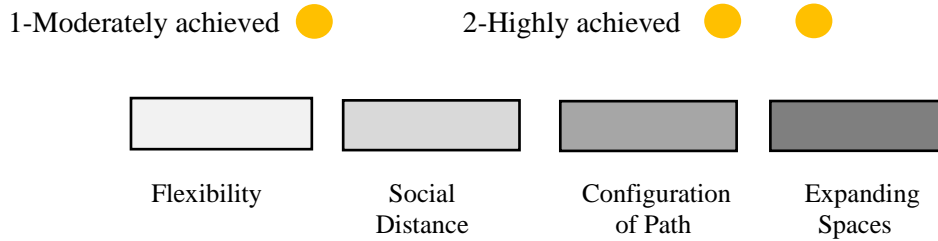
3.2.5 Conclusion of the case study II

After analysing the parameters of the case study two, Rising Together: The Black Experience with Police in America exhibition, the table 3.3 will highlight these parameters and their characteristics and descriptions concerning the reconfiguration of galleries after covid-19, to ensure safety for visitors. The new strategies in such spaces clarify the right circulation to reduce the spread of this virus.

Table 4: Parameters of analysis of Case Study II

Parameters	Figures	Characteristics
Flexibility		Adopting floor labels Providing stairs for one way direction Ensuring elevators for only visitors that need help to move
Social distancing		Providing 6 feet apart in enclosed areas
Configuration of path		Defining entrance and exit Dividing galleries into zones One-way circulation
Expanding spaces		Extending the space to the outdoor Providing 6 foot apart

The selected projects mentioned above have been compared and evaluated according to the characteristics of parameters: Flexibility, Social Distancing, Configuration of Path and Expanding Spaces. After comparing the examples in terms of the mentioned parameters, the evaluation has been classified into two categories:



3.4 Survey and Data Collection

Constraints on using public space and physical separation have been critical policy interventions in reducing the spread of COVID-19 and protecting citizens. Half of the world's population was asked to stay at home and take into consideration in the first place the social distancing in any place. This paper will highlight emerging questions at the interface of this pandemic and public spaces. A social survey was executed in Beirut City during the early days of the COVID-19 pandemic to study the effects of this outbreak disease on the concept of usage and the changing perception of public spaces.

The first part of the field methodology is examined by a statical analysis based on an online survey, using primary data. As primary data, this questionnaire will be conducted with 30 participants living within Beirut city between the dates of 23 and 27 of May 2021. This part also consists of personal information related to each participant (age, gender, income level, education level...). This part explains the methodology with details in data analyzed, and statistical methods used to the persons were filling the questionnaire. The second part shares the main findings of the study under the titles of ‘new considerations in designing the circulation elements to reduce Covid-19 infection, and ‘the acceleration of the mainstreaming of health into the design of public spaces ‘with brief discussions. The third part will be elaborated with interpretations and discussions in response to the questions, and the aim should be clarified. The conclusion part consists of general evaluations with recommendations for further studies.

Four types of questions investigate the changing perception and usage of public spaces:

- How often did you visit public spaces and how has your use of such spaces changed since the start of pandemic?
- What are the new considerations in designing the circulation elements in public spaces during the pandemic?
- How much the new strategies are important in affecting the mental and physical health during the pandemic?
- Will the pandemic accelerate the mainstreaming of health criteria into the architecture design of public spaces?

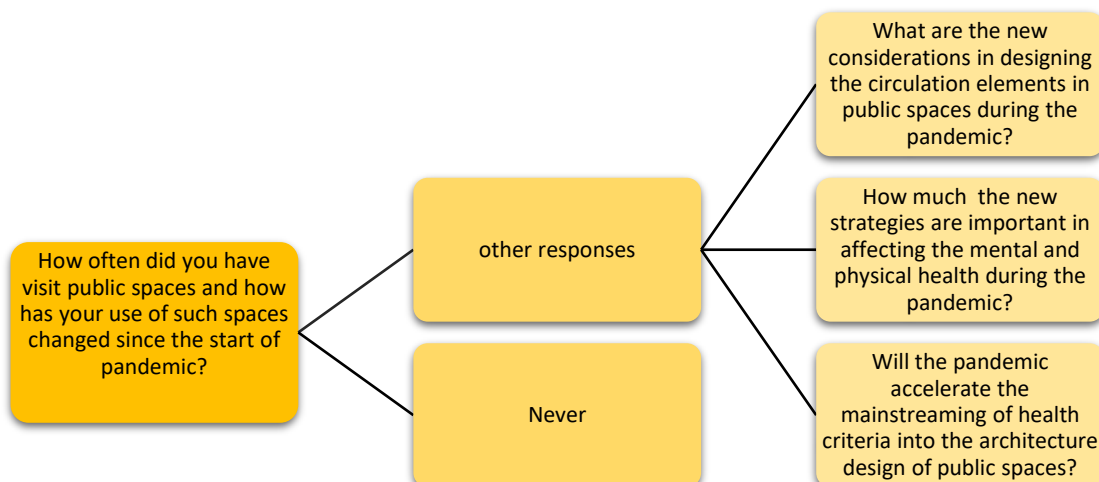


Fig.13: Diagram showing the hierarchy of the survey

4. FINDINGS

There are 30 answers that are collected, analysed qualitatively, and conducted into charts and tables concerning the four main questions, to be able to discuss later on the main ideas and topics.

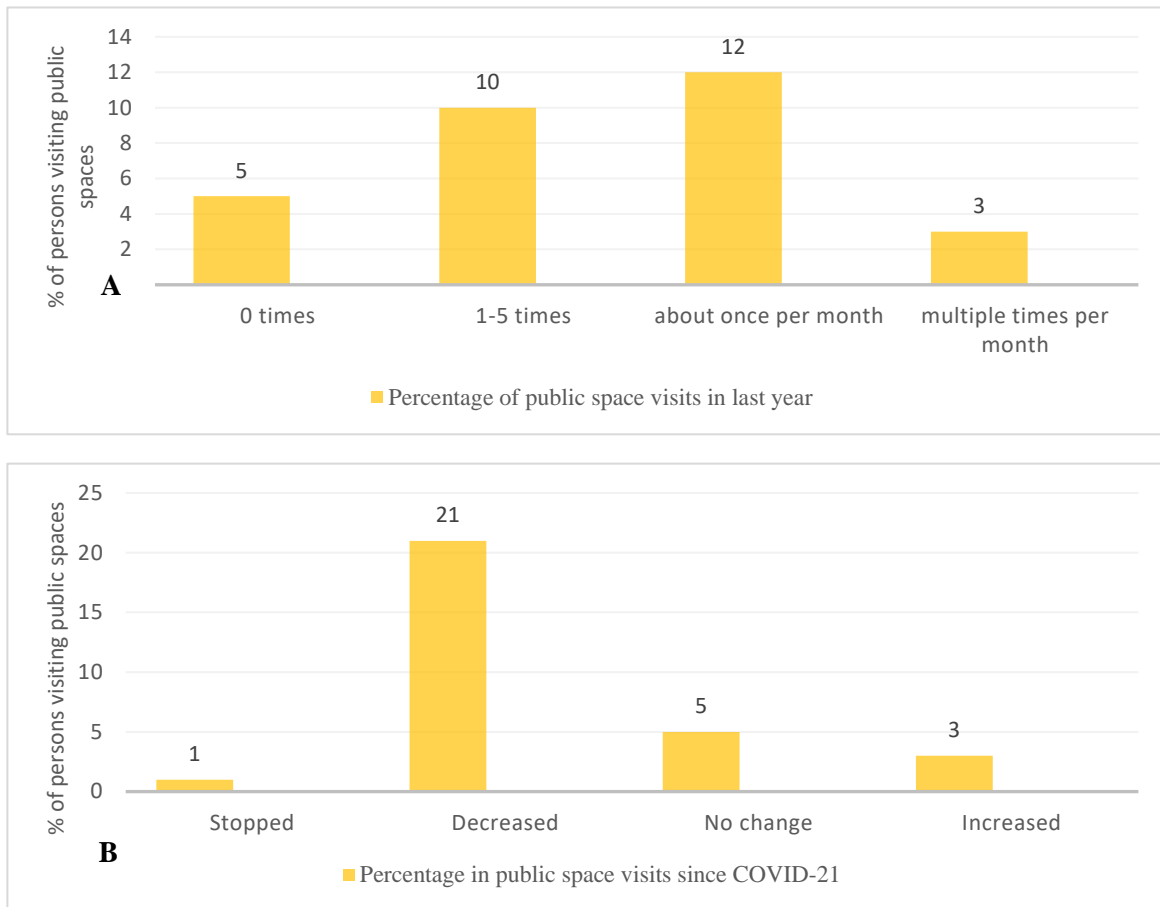


Fig.14: The distribution of responses to the question “How often did you have visit public spaces (A)and how has your use of such spaces changed since the start of pandemic (B)?”
Source: survey (2021)

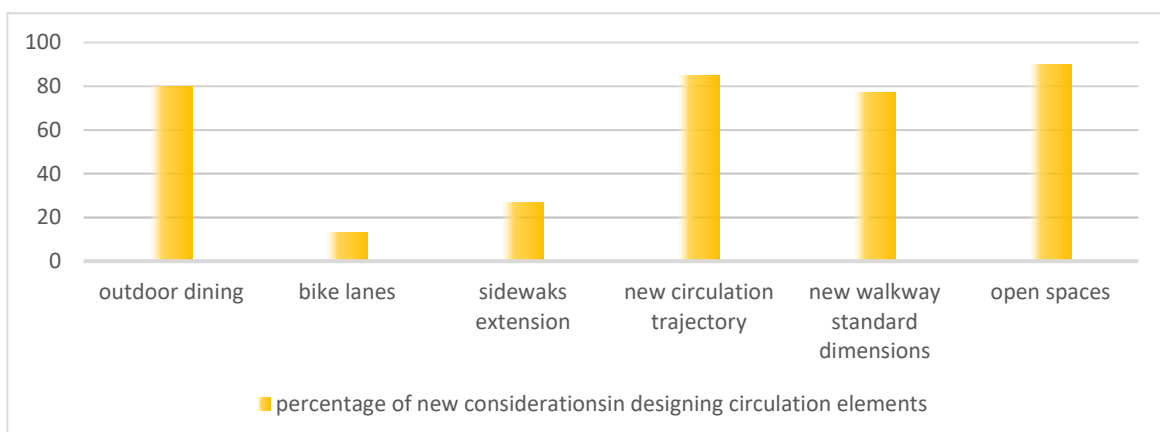


Fig.15: The distribution of responses to the question “What are the new considerations in designing the circulation elements in public spaces during the pandemic?”
Source: survey (2021)

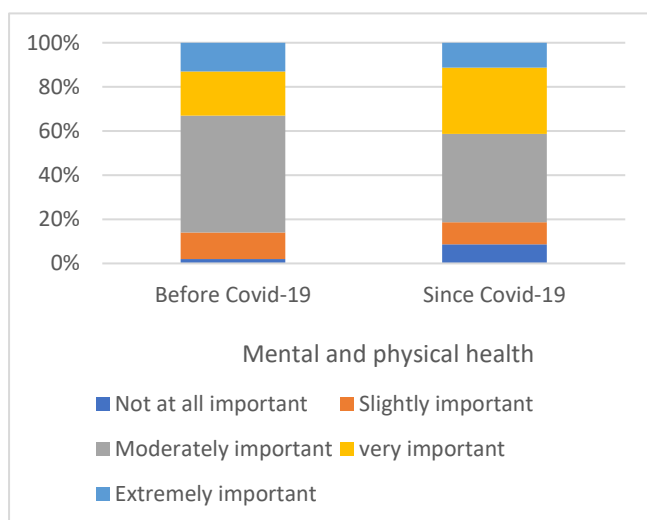


Fig.16: The perceived importance of public spaces for mental and physical health before (left-hand bars) and during (right-hand bars) the pandemic.

Source: survey (2021)

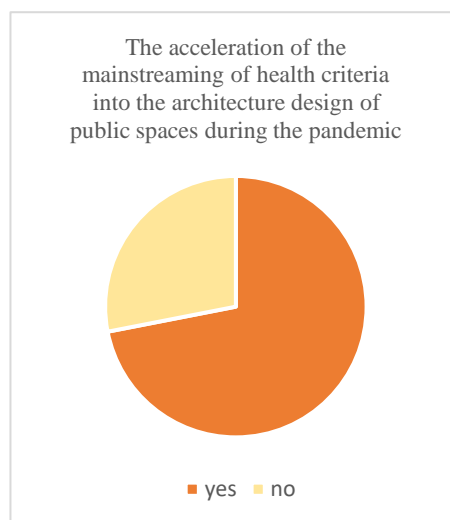


Fig.17: The distribution of responses to the question "Will the pandemic accelerate the mainstreaming of health criteria into the architecture design of public spaces?"

Source: survey (2021)

5. DISCUSSION

The responses were filtered for analysis. The charts were conducted allowing the interpretation of the behaviour and perception of users towards public spaces before and during COVID-19.

Based on the charts of the first question in the survey, the percentage of people visiting public spaces once per month was approximately 40 % representing the majority of users while the minority, who represents about 16.6 % rarely visit public spaces. This survey highlights the importance of public spaces. Since Covid-19, around 70 % of people decreased their number of visits to public spaces. The spread of the virus was not an obstacle for a minority of people who still managed to access these spaces.

Regarding the second question, there are numerous considerations detected by users regarding the design of the circulation elements in public spaces. The majority of the comments deducted were related to open spaces. Some observations were that not all open spaces involved were outdoor, some of them include interior spaces. The architecture was mentioned through its circulation features who transformed by 85 %. Other important remarks were related to the design of the urban planning and streets such as involving new bike lanes (15 %), sidewalks extension (25%). New concept was appealed in terms of pathway dimensions (77%).

Furthermore, the majority of respondents reported that they currently consider public spaces to be extremely important for their mental and physical health as number shows in the related chart. The most common purpose people had for using public spaces were exercise and relaxation. People seem to be using open spaces more than three outbreaks. The public spaces are considered an escape from routine. Even with the variable proximity, the public still fears overcrowded places because of the high risk of spread in these places.

Finally, a question have been asked about the acceleration of the mainstreaming of health criteria into the architecture design of public spaces after the pandemic. The majority of the respondents think that there is a strong connection between the health criteria and the architectural design of certain spaces.

Based on the survey conducted and the previous interpretations, there are new considerations for the circulation elements in the public spaces. The strategies were not exclusive to architecture but there is a link between these approaches and urban planning, street design and the behaviour of users within these spaces.

- New concept of outdoor dining



Fig.17: One of the new concepts of outdoor dining
How long could Chicago's indoor dining ban last? At least 2-3 weeks Pritzker says. (2020, November 3). Block Club Chicago.

- Involving new bike lanes



Fig.18: Involving new bike lanes
COVID-19: ActiveTO - Expanding the cycling network. (2020, June 26). City of Toronto.

- Sidewalks extension



Fig.19: Execution of Sidewalks extension
Kaisar, V. (2021, June 15). B.C. government in favour of municipalities making temporary patios permanent in post-pandemic world. Radio NL - Kamloops News.

- New circulation trajectory



Fig.20: New Circulation Trajectory
Kaisar, V. (2021, June 15). B.C. government in favour of municipalities making temporary patios permanent in post-pandemic world. Radio NL - Kamloops News.

- New walkways standards circulation trajectory



Fig.21: New walkways standards dimensions
Gallery of 7 design guidelines for a safe post COVID-19 transition - 7. (n.d.).

- New circulation trajectory



Fig.22: Execution of new circulation trajectory
Gallery of 7 design guidelines for a safe post COVID-19 transition - 7. (n.d.). ArchDaily.

The following diagram shows the strategies to be taken into consideration when designing spaces in order to reduce infection, this will have a crucial role during the pandemic period as architectural projects will have to implement and consider these approaches during the design of a space.

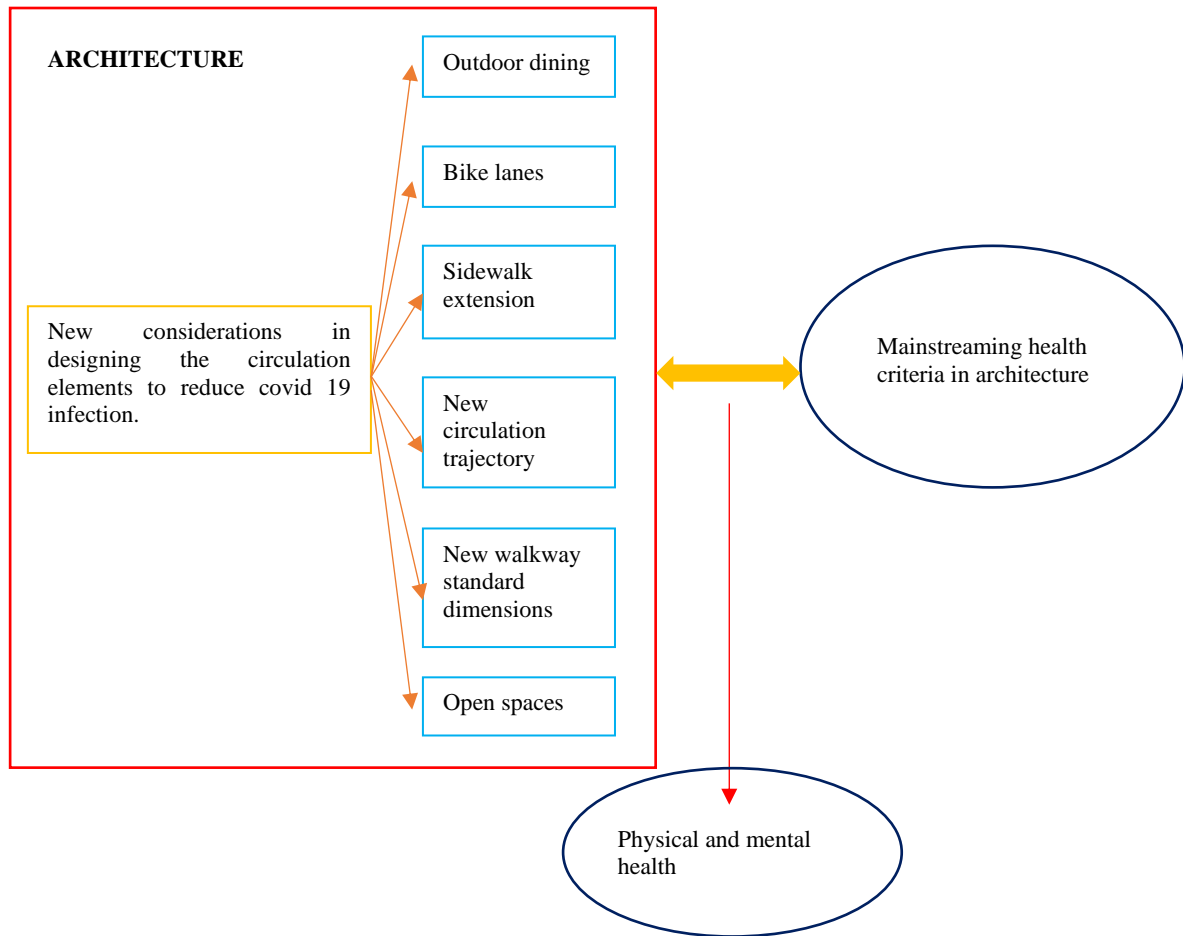


Fig.23: Diagram showing the new architectural considerations in relation to health criteria

6. CONCLUSION

Based on the preceding research, the study can provide innovative design and architectural guidelines essential for the adaptation of users thus determining basic and radical considerations in planning the design of the movable circulation elements in question during Covid-19. The points presented as follows:

- A. Public spaces, being the heart of cities, are one of the biggest indicators of the urban aspect. Social interaction is practiced most of the time in public spaces. Indeed, the quality of city life can be retrieved from the quality of public spaces, the design and accessibility of these spaces are crucial in the city planning strategies. For the time being, the Covid-19 disease interrupted social life in the city. It caused serious changes in insight and usage of public spaces, which are the elementary elements of the city. The longer the outbreak, the larger its impact on the design and planning of public spaces.
- B. Aiming on responding constructively to the COVID-19 pandemic, many architects have relied on what they know best: design and innovation. The new limitations placed on society have been a factor to rethink much of what we take for granted in the built environment. The way the world has adapted to this new lifestyle may forecast new ordinary following the COVID-19 outbreak. Though one cannot say exactly what the future will look like, nevertheless, the examination of current trends, strategies and concepts that have played huge roles during the pandemic has been taken place. The trends may have long lasting impacts on the way cities are designed.

C. Public spaces provide a host of mental and physical health advantages. Multiple studies indicate how they promote and enhance physical activity, and help people heal from illness in a shorter period. The crucial importance of such spaces in this study, and the fact that standings of urban green space's significance increased during the pandemic, point to the necessity of allowing continuous access to these spaces during times of emergency to prevent further disproportions in public health.

There is a range of areas for attention in relation to intervention and research that was identified. The following recommendations are based on the study findings:

D. To architects, there should be new rules and strategies to keep in mind when designing a space during or after the pandemic that impacted people's everyday live. In addition to that, the connection between architecture and the health criteria should be taken into consideration.

E. To students, even when the pandemic is over, new criteria of design and considerations shall be taking place in the project for it to be functional for a long time.

F. To users, the visibility of behaviour and perceptions will lead architecture into being in the service of the community. The reviews are fundamentals for responding to future extreme events.

7. ACKNOWLEDGEMENT

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