

REDEFINING THE ROLE OF ARCHITECTURE DURING THE PANDEMIC CRISIS

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ABSTRACT

This paper focuses on the two-way relationship between a pandemic and architecture. Architecture serves human needs, adapts to them and evolves because of them. This study aims to investigate the issues and challenges that arose in modern housing during the spread of the COVID-19 pandemic. A historical review of the pandemics which have plagued humanity is briefly described. Pandemics, as global emergencies, affect human life, the places where the individual is active, and, consequently, the architectural structures. For this reason, the main tool of the study was a questionnaire that was developed and distributed to young people aged between 18 to 35, living in European cities with a population of more than one million. In this way, an initial study was conducted to find out about ways of living during the pandemic and to question how modern architecture will be affected by the current pandemic. In a big part, World War II has formed the current complex housing structures in the modern world. Today, due to the COVID-19 pandemic, the current transitional era has brought changes to peoples' lifestyles. The paper continues with the presentation and analysis of the questionnaire's answers and records the houses' current issues due to this crisis. The study concludes with certain themes of potential design and environmental strategies for sustainable housing, to improve the individuals' quality of life.

KEYWORDS

Architecture; pandemic; COVID-19; housing structures; sustainable housing.

1. INTRODUCTION

This paper is an open-ended study analyzing the relationship between the pandemic and architecture. The term pandemic expresses the rapid spread of infectious diseases in large areas of the Earth or on a global scale. The word is composed of the Greek terms "πας + δῆμος", which mean "all" the "population". The emergence of pandemics is not something new for humanity. Since ancient times people have managed to deal with and stop pandemics. The discovery of antibiotics in the 20th century, for example, has helped the Bubonic Plague and other bacterial diseases become much less deadly. It is well known that the best way to defeat a virus is immunity. Immunity can come either naturally, by getting sick and developing antibodies or technically through the administration of a vaccine (Paul Fine, Ken Eames, David L. Heymann, 2011). So, the most effective way to deal with the COVID-19 pandemic was to develop as quickly as possible. However, since the virus was spreading and millions of people were losing their lives, the only solution to slow down the transmission of the virus, while developing the corresponding vaccines, was to follow

an older method. In fact, this method was invented seven centuries ago for the treatment of the black death: quarantine, or in its more contemporary version: confinement and social distancing, which is avoidance of overcrowding and close contact to reduce the transmission of the virus.

Pandemics have been milestones in human history that have overturned the conditions of human life—as these existed before their appearance— and have created radical changes in the field of architecture. As a pandemic affects everyday life, it would not be possible to leave architecture unaffected.

Architecture, in turn, is shaped through social and individual needs but at the same time it may shape new tendencies. Modernism in the early twentieth century emerged from a time when the concept of therapy was still associated with superstitions and prejudices, while the application of scientific methods was still at an early stage. However, modern functional lifestyles had already begun to emphasize cleanliness, hygiene, fresh air and sunlight. Epidemics from the recent past can teach us how architecture can help combat the spread of infectious disease, especially if the main ways of their transmission are considered and taken into account: air, surfaces and water (Michael Murphy, 2020). In the 1920s, as it was inevitable, the architecture of leading modernists, such as Le Corbusier, Aalto, and Duiker, was affected by the pandemic of the time. The tuberculosis disease established a clean, white, luminous, well-ventilated modern architecture with open-air spaces. Villa Savoye and sanatoriums in Paimio and Zonnestraal set some of the principles of modernism: flat roofs, terraces, specially designed interiors and furniture with precision (Med Hist, 2005). Paimio Sanatorium by architect Alvar Aalto was a prime example of modern sanatoriums. Built at the highest point of a pine forest, it provided its patients with unlimited access to fresh air and light. Aalto chose colors that could have a positive impact on patients. The

walls were light in color, while the ceilings were dark, in an attempt to make the general tone calmer from the perspective of a patient lying on a bed.

On the top floor, the architect designed a terrace throughout the south-facing wing, where patients lay down for hours as part of their treatment. Moreover, furniture and lighting fixtures -which were designed for the sanatorium by Alvar Aalto together with his wife Aino- have become notable elements of design, such as the armchair model 41, which was designed to help patients breathe better, inclined individual washbasins, designed so that each patient could avoid accidental wetting from water and disturbance of the other patients etc (Diana Anderson, 2010). Zonnestraal Sanatorium by Jan Duiker was an ornament of the modern movement designed of concrete and glass. Zonnestraal was built as a tuberculosis sanatorium in the 1920s and 1930s. The main concern was the provision of open spaces and exposure to fresh air. The entire floor plan of the building used a 3mx3m grid, following the principles of the modular architecture of Le Corbusier. The enclosure had a great amount of transparency, using materials that allowed as much light as possible to enter the patients' rooms. Duiker aimed to make his buildings light and airy. He also tried to illuminate the interiors by painting them with light blue and cream colors. (Med Hist. 2005).

If tuberculosis contributed greatly to the definition of modern architecture, we may assume respectively that COVID-19, combined with confinement at home, will affect contemporary architecture in the near future. In contrast to the airy, pristine, minimal space of modernism, the area which was required to protect us from COVID-19 has been isolated, with dividing partitions between people and with a minimum social distance of 1.5 meters. Widely open-air spaces seem to have been preferred, whereas closed spaces have been in need of remodelling.

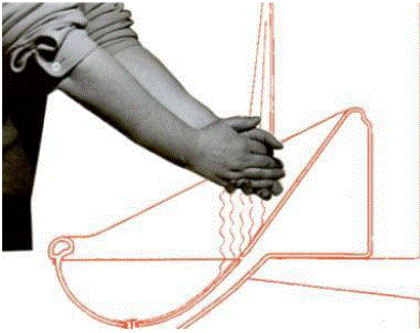


Figure 1. Noiseless wash basin with 45 degrees inclination. Source: Alvar Aalto Museum [edited by author]

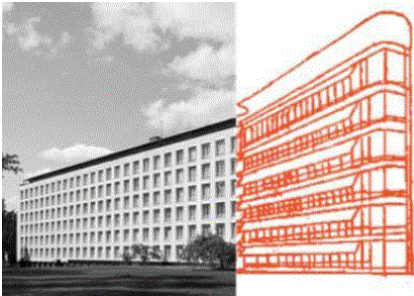


Figure 2. Paimio Sanatorium facade. Source: Majja Holma, Alvar Aalto Museum [edited by author]



Figure 3. chair model 41, Pikkus Source: Suvi Kesäläinen, [edited by author]

For the vast majority of people, our house is the most important building in our lives, but we rarely have a say in its original design (Nicola Gillen, Pippa Nissen, Julia Park, Adam Scott, Sumita Singha, Helen Taylor, Ian Taylor, Sarah Featherstone, 2021). COVID-19 has brought to the surface the already existing problems and has revealed new weaknesses in many aspects of our lives. Housing has been among the most obvious cases, especially during the quarantine period, while our home has never been more important in dealing with a pandemic (Kyle Chayka, 2020).

In 2020 people worldwide have spent more time inside their homes than in any previous year and certain things, such as high internet connection speeds or ergonomically designed chairs have been high on wishlists. Being confined at home undoubtedly requires imagination and innovation, ergonomic design, and the use of advanced technological means in our habitable space. Fundamental architectural principles, such as access to an outdoor area, pleasant views, adequate natural lighting, ventilation, and controlled interior temperature have proven to be not mere advantages, but essential features of a home. Similar to previous moments in history when health and social crises led to changes in architecture, the pandemic offers an opportunity to re-evaluate design and space standards (Goode 2021). Pandemics changed the usual living conditions of humans, as the aim was to stop the spread of specific microorganisms. Thus, the tactic of forced confinement has often been adopted to achieve social distancing and reduce the rate of transmissibility. In the recent case of COVID-19, this practice resulted in individuals modifying their daily life, so that all their activities could take place in their residence, by using all available technological means. This study aims to review the new conditions which were formed due to the spread of the COVID-19 pandemic.

2. METHODOLOGY

This paper is part of a research thesis, conducted during the lockdown period. Due to the fact that the current pandemic is still active, this is an initial study which aims to examine the changes that have brought new challenges in the way of living during the pandemic and to investigate the potential impact of Covid-19 on contemporary architecture, in the hope of becoming a starting point for further research. The main tool chosen was an online survey, which focused on European urban centers. The method of the questionnaire was chosen for the collection of data which was completed in two phases. The first one was conducted between May and June 2021 and included 42 structured questions which reflected on general information about the participants, their residential environment, their home use and user satisfaction with dwelling space. Later on, the questionnaire was repeated in September 2022 reaching an extended target group and it was enriched by 46 questions in regard to relationships between spatial environment, housing design and wellbeing. Certain criteria that would maximize the challenges confronted during the pandemic defined the structure of the online survey. The questionnaire referred to the specific period between March 2020 and June 2021; a period of time when design failures in dwellings were easier to perceive, since the house became the place for various activities, in order to avoid the transmission of the virus. The majority of people were obliged to work remotely at their home while educational institutions offered their services through online learning systems.

The questionnaire was aimed at young people aged between 18 and 35, an age range familiar with the main author, which could ensure easy access to the audience, facilitate the online collection and the further reflection of data. Moreover, younger people spent lockdown with less space than those

in older age groups. According to Judge and Rahman [2020], older households aged 65+ have almost twice as much usable space than younger households (16-34) who are also twice as likely to lack access to a private garden than those 65 and over.

The questionnaire was addressed only to residents of Europe, in cities with more than one million inhabitants. The COVID-19 pandemic challenges during lockdowns were inevitably bigger in highly populated cities, where the virus was spread at a very fast pace. Moreover, after the end of World War II, cities in Europe began mass reconstruction and the creation of urban centers. (Nicholas Bullock, 2002). Mass reconstruction could have evolved into a good practice if there had been architectural criteria and implementation of contemporary urban planning strategies. Rapid post-war development and the densification of centers, traffic congestion and lack of open spaces created severe problems in the urban fabric and consequently in the citizens' wellbeing. The increasing development of apartment buildings based on private funds, combined with a motive for direct profit, unclear aesthetic rules and untargeted design, combined with the inadequacy of the legislation frame and building permit procedure, have inevitably led to a specific character of the city image with identical high-rise concrete blocks of flats, limited provision for viable public space, dense habitation with problematic neighboring relationships, environmental degradation and finally alienation of people. (Selana Vronti, 2015). This framework was further challenged by the current pandemic and was decided as the preferred setting for the online survey.

A total of 146 people took part in the first survey which was reopened to include another 70 people, reaching a total of 216 respondents. The study was conducted through google forms the first one, and typeform the additional one. The results were edited with google sheets.

3. FINDINGS

3.1. General information about the participants

The general profile of the participants and the countries which participated are presented in the diagrams that follow. Most respondents came from Greece, whereas a significant number participated from Belgium, Bulgaria, Croatia, Czech Republic, France, Germany, Italy, The Netherlands, North Macedonia, Poland, Portugal, Romania, Spain, Sweden, Turkey and the United Kingdom.



Table 1. Participating countries

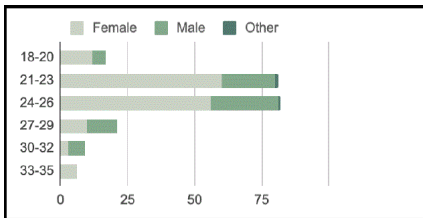


Table 2. Gender and age of the participants

One of the main questions asked was regarding the mode of working and studying. It is worth noting that, during the pandemic, 53.8% of teleworking took place in the field of work, whereas 90.6% of academic courses were completed via tele-education. Both percentages, however, indicated that the majority of young people carried out their activities online.

If you are an employee, what working model did you use most during the pandemic?	
Work in person	Work from home
30.8%	53.8%
Suspension of work	Other
9.2%	6.2%

Table 3. Work situation

If you are a student, how did your courses mostly take place during the academic period?	
University classes	Online classes
4.7%	90.6%
Both of the above	
4.7%	

Table 4. Studies situation

3.2. Information about the residential environment

Following the delineation of the participants, basic information on their residential environment was gathered to better understand the context of confinement. One of the most interesting observations was that the majority of young people tend to stay in spacious houses, usually between 80 and 120 square meters [which does not align with the aforementioned study of Judge and Rahman [2020]. This finding is attributed to the fact that they live together with other people, as will be mentioned later. In the aforementioned question, it is evident that despite the spacious surface of the houses, their largest percentage (57.9%) has only one bathroom. In general, it seems that it is necessary to have at least two toilets in one residence so that one is mainly used by the residents and the second one acts as an auxiliary bathroom for visitors and patients. (Rousakou Elpida, 2015).

What is worth noting -in the previous table and the one that follows- is that although 78.2% of the residencies do not have a garden, a probable consequence of habitation in a big city, a large percentage of them have semi-open or outdoor spaces. Moreover, despite the doubts and challenges brought by COVID-19, the participants seem to have adequate lighting and ventilation in their homes, which was a positive finding.

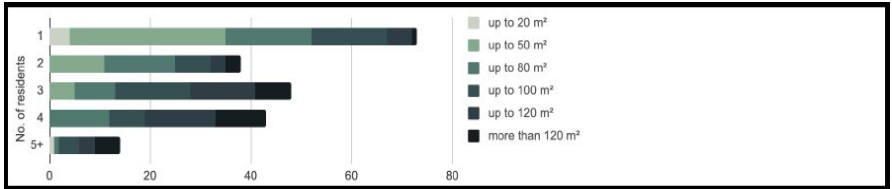


Table 5. Houses square meters comparing to the residents of it

How many bedrooms does your house have?			
1	2	3	4+
25.0%	24.1%	33.3%	17.6%

Table 6

Approximately how many square meters are the semi-outdoor, balconies, and outdoor spaces in total?		
0sqm	up to 5sqm	up to 10sqm
14.4%	21.8%	28.2%
up to 15sqm	up to 20sqm	above 20sqm
15.3%	13.4%	6.9%

Table 11

How many bathrooms does your house have?			
1	2	3	4+
57.9%	31.5%	6.5%	4.2%

Table 7

Does your house have a garden?	
Yes	No
21.8%	78.2%

Table 12

What would be the ideal number of bedrooms?					
1	2	3	4	5	6+
10.1%	29.0%	34.8%	15.9%	7.2%	2.9%

Table 8. out of 70 answers

Does your house have adequate window lighting?	
Yes	No
83.8%	16.2%

Table 13

What would be the ideal number of bathrooms?					
1	2	3	4	5	6+
24.6%	53.6%	13.0%	5.8%	0.0%	2.9%

Table 9. out of 70 answers

Does your house have adequate ventilation?	
Yes	No
85.6%	14.4%

Table 14

How many autonomous common areas (living room, kitchen, dining room, etc.) does your house have?	
1	2
28.2%	44.9%
3	4+
19.0%	7.9%

Table 10

3.3. General Information about the life at home during the pandemic

This chapter presents data on life in the residential dwelling and especially on the people who lived together during the quarantine period. As it is indicated below in the respective tables, 79.2% share their home and most young people live with their families.

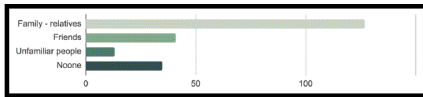


Table 15. Who did you live mostly with?

If they do not share their residence:

Did confinement at your own house affect you psychologically during the pandemic?	
Yes	No
77.1%	22.9%

Table 16

Would you rather have roommates during the pandemic?	
Yes	No
74.3%	25.7%

Table 17

In case the participant lived on their own, a 77.1% recorded percentage was affected psychologically due to their confinement. Recent research has shown that depression rates during the period of confinement tripled (Andreas Zachariadis, 2021). In case of depression, it is recommended to invest time with family and friends. This may also justify the increased number of people who, in a similar case, declared their preference for living together. (Nirmita Panchal, 2021).

If they do share their residence:

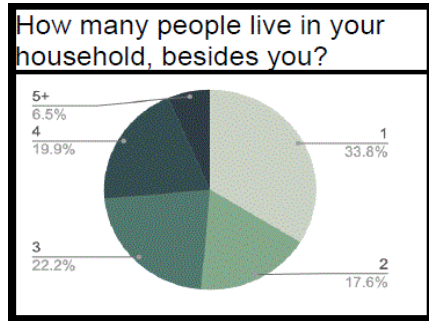


Table 18

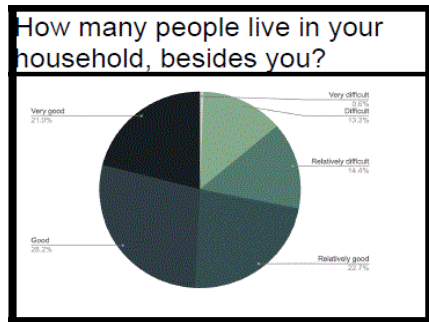


Table 19

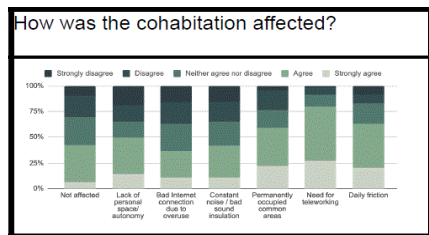


Table 20

As mentioned earlier, the largest percentage of participants [58.8%] live with their families. Usually, the number of people living together in the same house ranges from 1 to 3 people, without taking the participant into account, i.e. a total of 2 to 4 people. Finally, the conditions of cohabitation are positive for the majority of the participants, since 21.0% responded that they have "very good" relations with their roommates and 28.2% of them described them as "good".

Almost 1 in 3 participants claimed that they felt a violation of their personal space. In the accompanying qualitative question "If so, how was it sidelined?" several stated that there was inevitable augmented daily friction among the flatmates and often -due to the different daily simultaneous activities- tension was created. Still, others said that since the whole family had to spend all hours of the day inside the house, common areas were constantly crowded, while their house was converted into an office, a sleeping area, a relaxation area, or a gym at the same time.

3.4. Information about the habits that the participants developed during the pandemic

Diagrams 21 and 22 show different activities that the participants were asked to engage with in their bedroom and the common areas of their house, respectively. Most of them seem to have performed reading/studying and working out secluded, in their bedroom, as it is a more private space of their house. On the other hand, the living room or the common areas, in general, were used for food preparation and consumption, which is expected since having a meal is a more social practice.

In the following questions, it seems that most participants were neutral as to the need to renew and remodel their house, with a very slight inclination towards change. Specifically, only 18.0% responded that they felt the need to remodel the house "rarely" or "very rarely", compared to 38.4% who

answered "often" or "very often". However, it seems that 57.4% of the participants did make some alterations to their home environment and this helped them improve their overall psychology, as is reflected in the corresponding percentage of 86.9%. Finally, the modifications that occurred were mainly minor changes, such as the addition of paintings, indoor plants or other decorative elements, changing the colors of walls and other surfaces, etc; that is modifications in general that helped in the renewal of space, aiming to create a more hospitable and aesthetically pleasing living environment.

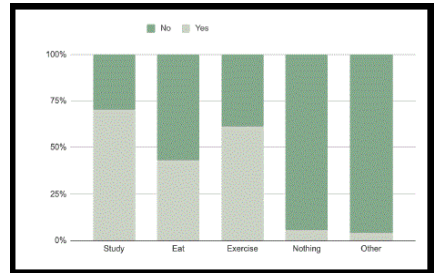


Table 21. What activities were you invited to do in your bedroom during the pandemic?

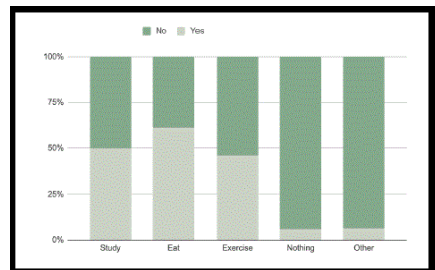


Table 22. What activities were you invited to do in your living room or other common areas during the pandemic?

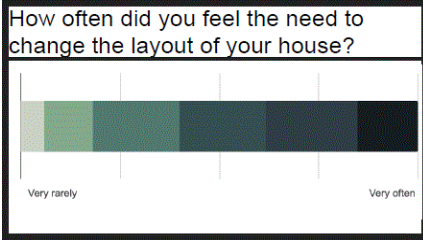


Table 23

Did you make any changes to your house during the pandemic?	
Yes	No
57.4%	42.6%

Table 24

If yes, did it help you improve your mental health?	
Yes	No
78.3%	21.7%

Table 25

Regarding the performance of technology and the internet, more than half of them seem to have faced technology problems (59.7%), with the majority of them mentioning low internet speeds and the lack of an adequate number of computers to meet the needs of all house members.

Was the technology/internet performance at your place of residence adequate during the pandemic?	
Yes	No
59.7%	40.3%

Table 26

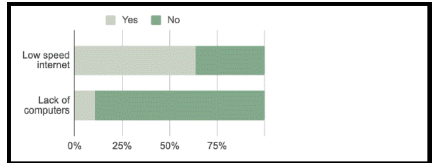


Table 27. What were the problems they faced, out of the 59.7% that said yes.

Most of the participants seem to have spent the majority of the day inside their bedrooms, where almost everyday activities took place and a higher level of privacy could be achieved.

Participants were then asked what they considered to be the biggest advantage and disadvantage of their home, respectively, during the pandemic. It has been observed that there was a consensus of views on what constitutes a positive and a negative feature of a dwelling. The key features highlighted in both questions were:

Positive:

- Balconies or terraces which offered contact with the outdoor environment, Luminosity and sound insulation, Adequacy of rooms/ spaces to meet the needs of all residents,

Negative:

- Insufficient number of sanitary facilities and finally, the inadequacy of an independent workplace or study area, such as an office space.

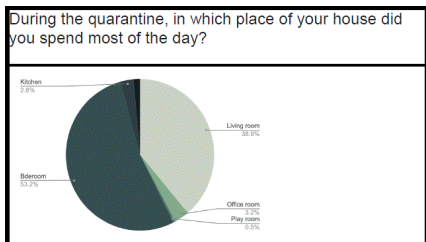


Table 28

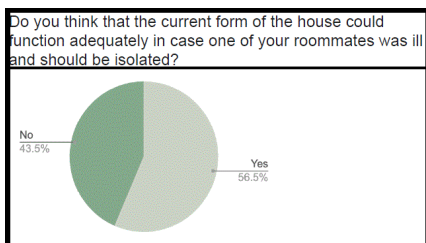


Table 29

Furthermore, the participants were questioned about their lifestyle and the changes that occurred to it during the pandemic, but also about whether they maintained these newly adopted habits until today.

The vast majority seem to have followed a healthier lifestyle with better nutrition and new hobbies, such as sports; habits that many tried to maintain after the end of their mandatory confinement. On the other hand, some reported their lack of mood and their performance in harmful habits for health, such as smoking and alcohol or the consumption of unhealthy snacks.

Finally, very little divergence was observed in the question of whether the form of one's residence could function adequately if one of the roommates became ill and had to be isolated. A percentage of 54.4% responded positively while 45.6% answered negatively, arguing that if such an issue would arise then

they would not be able to deal with it, mostly because of the lack of a second toilet or an additional room, necessary for the seclusion of the patient.

4. DISCUSSION AND CONCLUSIONS

The present paper studied the role of housing during the critical periods of the pandemic and emphasized on the current situation as it was shaped by COVID-19. The role that architecture plays in developing a healthy and sustainable environment is important in addressing the challenges associated with rapidly transmitting diseases such as COVID-19. The idea that a disease can reshape and define the architecture of each period is a fact that has troubled the respective community in recent times. The aim is always to develop solutions to limit and control the transmission of the disease. These last years have led the world to face the challenges of the pandemic. As a consequence, we have witnessed inevitable changes in all aspects of human life, the need for new different scenarios of using our living space, but also the development of interactions between the users of the home. People were forced to shape their place of habitation by adapting it to their own living and working requirements (Zecca et al, 2020).

As the answers to the questionnaire demonstrate, the respondents spent a significant amount of time at home, thus inevitably the space, size and design of their home had a serious impact on their daily living experience. Due to this increase in time engaged at their dwellings, the respondents became aware of the positive and negative features of their homes. They also realized that existing dwelling spaces had to be re-organized to host multi-functional areas and simultaneous activities.

As it was aforementioned, targeted housing design is an important solution in dealing with a pandemic, both to limit the disease and to ensure the physical and mental health of the people who live in it. Understanding

and analyzing the critical housing issues that arose after the spread of COVID-19 and worsened during the quarantine is a first step toward highlighting the need for targeted housing design. We should learn from the previous pandemics that humans need to live in high-quality sustainable spaces, which may offer adequate comfort conditions [luminosity, temperature, ventilation, humidity] and help them come into contact with nature. In cases, such as confinement, where this contact was not possible these past two years, there was an effort to create 'green' spaces in the residences by placing plants both outdoors and indoors. Moreover, it is concluded from this present study that housing units should embrace flexibility, creating the possibility to accommodate different functions that occur simultaneously, consider the possibility of a potential division of area to offer undisturbed personal space, and allow the harmonic and functional cohabitation of several humans in one residence, even in the case of an illness, by the provision of an autonomous room and hygiene area for a patient. Apart from privacy, one major theme that came out was the need for direct access to an open space. Although most participants' houses lack gardens, the key feature highlighted in a house was the contact with the outdoor environment. Looking back in the previous pandemics paradigms, exposure to sunlight, nature and fresh air have been considered essential for people's physical and mental health. Probably, during the threat of the pandemic, for most people, home becomes the safe place for protection and survival. However, responses reveal that for a big part of participants, this safe space was reduced to the limited area of their bedroom. Moreover, the variety of activities, including housing habits and remote working, which were happening simultaneously in one space, blurred the boundaries between work space and personal space. This is why most respondents wished for the presence of more individual spaces for

privacy and concentration. It should be noted though that if the house is transformed into a permanent workspace, the notion of dwelling and intimacy may be completely redefined.

The current pandemic underlines the vulnerability of housing design and urges for spatial resilience and optimization of certain standards. Re-defining spatial and behavioral changes in our homes may shape future needs and dwelling usability. Potential design and environmental strategies for sustainable housing, to improve the individuals' quality of life may include:

- obligatory direct access to private outdoor spaces
- flexibility in the layout of floor area, allowing its alternative division to minimum spaced autonomous rooms
- obligatory increase in the number of bathrooms depending on the number of inhabitants of a house
- optimization of standards [i.g. soundproof insulations in dividing walls] to improve environmental comfort
- optimization of technological infrastructure
- provision of funding for home renovation and adaptation

EPILOGUE

Some of the questions and challenges that have arisen and are worth mentioning, concern the following three pillars:

New normality

The ever-changing conditions in emergencies, such as pandemics, have led many people to recognize new needs and problems due to their new living conditions. This is made apparent initially by the creation of new habits and alternative ways of living, working, educating and entertaining. In addition, it has been necessary to convert the functions of certain places or units into completely new

uses to sufficiently serve the new needs of their users. All these facts raise the question of a new normality, as it has been experienced recently.

What will everyday life look like in the post-pandemic period? Which measures that were implemented during this period will become institutional in the subsequent normality? What impact will the pandemic cause in the urban space and the built environment in general? How will housing units and cities operate in the near future?

Pandemic reality

Previous pandemics, such as cholera, tuberculosis and Ebola, brought about similar changes and raised the question of the relationship between the pandemic and architecture, creating the conceptual framework of pandemic architecture. During the 19th century, design mechanisms were developed that had as their ultimate goal the development of treatment, health and cleanliness spaces. The current period concerns the transformation of housing and urban spaces to adapt them to the new pandemic reality. The directions are as follows:

- a. examination of housing scenarios with the possibility of isolating potential patients who do not need intensive care
- b. improving public health in the community and
- c. finding solutions to maintain the normal functioning of the city and the daily life of its residents.

Social distancing

The spatial experience of people as individuals and as communities are understood through broader concepts, which come from the field of social and psychological considerations of space and architecture. The main challenge that arose was the review of fair distance based on the criteria of spatial distancing and

maintaining social solidarity, as well as the harmonization of spatial and social relations. The urban fabric, as it is related to the understanding and recognition of the zones of habitation, work, education, etc., is an important source of information on the socio-spatial relations and experiences of people. On these bases, questions that emerged about the new interpersonal relationships and the relationship of humans with space have dealt with anthropometric and ergonomic issues as a core.

The fear of infection by disease had a decisive role in architecture and design during the period of modernism, when diseases such as tuberculosis, plague, etc. dominated throughout Europe. In the past months, a new conjuncture forming a two-way relationship between disease and architecture has emerged once more, where the fear of infection controls again what kind of spaces we want to live in. Just as tuberculosis shaped modernism, COVID-19 is going to affect contemporary architecture and create a turning point in the way architects will design buildings (Kyle Chayka, 2020).

There is a need to start a discussion in order to raise the new concerns that have emerged through the crisis of the COVID-19 pandemic. Instead of an epilogue, certain questions are asked with a view to reflection and further investigation, since the theme negotiated in this study is still open. These questions are: *how can planning and more specifically architectural design contribute to improving the quality of life of people in their homes? What data should be considered during the design and construction process of a structure? How will we achieve the adoption of more sustainable and 'green' practices? Finally, if we adopt the above practices, will we be able to deal effectively with a new pandemic in the future?*

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