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Identification and Prioritization of Cultural Center Design Solutions During Coronavirus and Post-Coronavirus Eras to Increase Social Interactions*

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ABSTRACT

Cultural centers gather people in society and enable them to practice cultural activities by laying the groundwork to establish social interactions. Following the outbreak of Coronavirus in 2019, public centers were shut down and governments were forced to take quarantine measures for the public. As the pandemic began to affect social conditions, cultural centers were no longer used as usual. The goal of this study was to provide solutions to design and prioritize cultural centers to increase and strengthen social interactions during the Coronavirus and post-coronavirus eras. Disregard Coronavirus and post-coronavirus eras, the solutions, which were supposed to both increase social interactions and prevent the spread of the virus, were extracted using the descriptive-analytical method and were then comparatively investigated. Commonalities between these two categories of solutions were identified as common components aimed at increasing social interactions in the post-coronavirus era and dealing with the virus in the Coronavirus era. These solutions were then prioritized using a survey method and a questionnaire tool by considering a sample volume of 100 medical and architectural experts using SPSS software and the Friedman Test. Findings showed that ventilation topped the list of priorities, with garden and greenery spaces, security, view and landscape, using vegetation and natural lighting taking the next priorities, respectively. Also, the solution of resiliency was proposed for the category of social and architectural interaction components that seemed likely to conflict with each other such as mixed land use and spatial integrity. Findings showed that the optimal location of openings facing each other and the building's appropriate orientation against regional winds, as well as terraces with green spaces and product cultivation spaces, green walls, and 24-hour uses, among others, were among the major solutions that could simultaneously improve several common components and influence sociability during the post-coronavirus era. These solutions, it was found, could also help maintain the main function of cultural spaces, i.e., sociability during the possible outbreak of a pandemic.

Keywords: Cultural Centers, Increased Social Interactions, Post-Coronavirus, Coronavirus, Resiliency.

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1. INTRODUCTION

Cultural centers in cities occupy parts of public spaces and gather the public to practice their cultural activities, thereby establishing a context for social relations. As Coronavirus broke out across the world in 2019, people were instructed to keep social distance and get quarantined, as the resulting situation, compounded with cultural centers' failure to deal with the problem, reduced social interaction among people.

Post-coronavirus changes led to a reduction in social interactions and made cultural centers fail to meet the fast pace of changes. For this, it was essential to design cultural spaces that would make up for the destructive quarantine impacts and prevent diseases by keeping social distance if similar pandemics were to unfold. Accordingly, this study aimed to identify the components of designing cultural centers that would improve social interactions during the post-coronavirus era and account for social needs if a similar pandemic were to occur. For this, the main question of the study was: "How are the architectural solutions of cultural spaces prioritized to help strengthen social interactions during the Coronavirus and post-coronavirus eras?"

The study process consisted of two sections to answer the above question. The first part used the descriptive-analytical method to collect the components increasing social interactions and those affecting social interactions during Coronavirus, and to identify common and conflicting components. The second part used the survey method and the questionnaire tool to prioritize common components, providing solutions, such as resiliency, to deal with conflicting components.

2. LITERATURE REVIEW

As the main subject of the study suggested, disregard the Coronavirus and post-coronavirus eras, social interaction and architectural components, examined in previous research, were investigated to prevent the outbreak of the virus in a short run. The literature has indicated that these two subjects share some common and conflicting characteristics, though suggestions are put forward for each of them.

2.1. Social Interactions

Social interactions denote a relationship formed between two or more people in which a known reaction is established between them (Behzadfar and Tahmasbi 2013). Man is intrinsically sociable and requires communicating with others and the outside world to enjoy a better life. Social relations are what humans need in society to establish relations to promote and improve their lives (Taheripour 2016).

Public spaces refer to spaces accessible to the public. As public spaces, cultural spaces not only serve as places for spending leisure but are also one of the main needs of an urban society that coordinates cultural affairs and strengthens participatory activities across an urban life. These spaces play a key role in identifying and promoting culture (Esfandiari and Khansari 2017). Also, cultural spaces provide diverse programs to prepare a conducive environment for social interactions (Mansouri and Saghafi Asl 2020).

The success of urban and public spaces is measured by the public's presence and how they are used. Therefore, public spaces should be capable of attracting the public and generating a setting for enhancing social interactions and solidarity. Today, some urban spaces lack the necessary qualities for strengthening social interactions (Zarei et al. 2016). A mere presence in these spaces does not help form social interactions; rather, the social dimensions of space should be taken into account to help realize sociability and spatial qualities (Karbelayi Hosseini Ghiassavand and Sohaili 2016).

Cultural spaces should provide a conducive environment for the presence and gathering of a large group of users. If the architectural characteristics of these spaces strengthen a sense of attachment, comfort, security, and readability, among users, they could provide a setting for interaction and relations among them. Public spaces such as libraries will certainly help establish dialogues, exchange views, and information and discussions, and should be so designed to attract as many users as possible (Esfandiari and Khansari 2017). Meanwhile, the environmental factors influencing social interactions include permeability, resiliency, diversity, vitality and readability, among others (Keramati and Vaziri 2013). Other factors may include privacy, a sense of attachment, a sense of belonging, crowdedness, social and environmental security, social trust, and participation in public spaces (Qanbaran and Jafari 2014).

Moreover, architectural components including accessibility, space quality, maintenance, and day/night security could significantly contribute to visiting public spaces. The more public spaces are secure, the more people feel comfortable. Also, there is a close relationship between easy accessibility and security (Mela and Tousi 2023). All these factors can increase public presence and help provide the environment for social interactions. The literature has also enumerated other components of social interaction, along with some references, listed in Table 1.

Table 1: Components Affecting Social Interactions

Components \ Researcher	(Heidari Dehkordi, Zamani 2016)	(Dezfouli, Naghizadeh 2013)	(Qanbaran, Jafari 2014)	(Daneshpour, Charkhchian 2007)	(Mansour Mahani 2015)	(Charkhchian, Daneshpour 2009)	(Etminani-Esfahani, Khodabakhshian 2015)	(Taheripour 2016)	(Yasini, Reza Soltani 2016)	(Negari, Javan Majidi 2016)	(Shadi, Sarkardei 2010)	(Mansouri, Saghafi Asl 2019)	(Talebi 2001)	(Samadi Fard, Khosrow Movahed 2013)	(Pandi, Afshar 2014)	(Shakiba 2016)	(Mash-hour 2012)	(Belali-e Oskui, Jafari 2022)	(Sahragard Monfared, Yazdanfar 2014)
Permeability	*						*		*		*	*				*		*	
Spatial Integrity	*								*										
Privacy	*		*			*			*	*	*					*			
Territory	*		*										*	*		*			*
Readability	*	*			*		*	*	*	*	*		*	*	*	*	*	*	*
Accessibility	*		*	*	*	*	*	*	*	*	*		*	*	*	*	*	*	
Location	*																*		
Dimensions-Proportions	*								*										
Increased Density									*										
Resiliency	*							*	*							*		*	
Form-Geometry	*							*	*	*									
Materials (Colour, Type, and Texture)- Natural Materials	*								*	*									
Climatic Comfort	*	*			*			*			*		*	*			*		
Security	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Defining the Body and Walls	*	*		*				*											
Inviting Entrance		*		*	*			*		*			*	*			*		
Appropriate Furniture	*	*			*	*	*	*		*	*	*	*	*	*	*	*	*	*
Degree of Illumination (Artificial And Natural)					*		*	*					*	*			*		*
Space Height										*									
Vitality					*			*	*	*		*			*	*	*		
View and Landscape					*			*		*			*	*	*	*	*	*	*
Appropriate Amenities						*		*			*					*			
Greenery					*		*	*		*	*		*	*		*	*		
Facilitating and Prioritizing Pedestrian Traffic	*										*	*		*					
Mixed Use	*	*													*				
Activity				*	*											*			
Diversity					*	*	*	*	*	*	*	*	*	*	*		*	*	*
Active Occupation (Walking-Talking)					*	*			*	*			*	*			*		
Non-Active Occupation (Observing Others)					*	*			*	*			*	*			*		

Components \ Researcher	(Heidari Dehkordi, Zamani 2016)	(Dezfouli, Naghizadeh 2013)	(Qanbaran, Jafari 2014)	(Daneshpour, Charkhchian 2007)	(Mansour Mahani 2015)	(Charkhchian, Daneshpour 2009)	(Etminani-Esfahani, Khodabakhshian 2015)	(Taheripour 2016)	(Yasini, Reza Soltani 2016)	(Negari, Javan Majidi 2016)	(Shadi, Sarkardei 2010)	(Mansouri, Saghafi Asl 2019)	(Talebi 2001)	(Samadi Fard, Khosrow Movahed 2013)	(Pandi, Afshar 2014)	(Shakiba 2016)	(Mash-hour 2012)	(Belali-e Oskui, Jafari 2022)	(Sahragard Monfared, Yazdanfar 2014)
Sociability		*	*	*	*			*	*			*				*			
Sense of Identity to Place	*		*	*		*		*	*	*	*		*	*		*			
Comfort and Convenience				*	*	*		*	*	*	*	*			*				
Multi-Functional Space																			*

2.2. Crises of the Prevalence of Coronavirus and its Impacts on Architecture

With advancements in technology, measures have been made to meet human physical and mental health. However, there are still many unknown factors affecting people's health. These factors may be associated with designing and constructing buildings or caused by external causes, such as virus outbreaks and infections, thereby endangering individual and collective health (Arabani and Bavari 2020).

A new disease known as Coronavirus, or COVID-19 in 2019 spread worldwide and was recognized as a global pandemic in 2020. Human history has witnessed various pandemics, but this emerging disease featured different implications (Pourabdollahi 2020). The unexpected spread of COVID-19 across the world and its growing rate caused security and safety concerns. Meanwhile, two solutions, namely quarantine and social distancing measures, enforced primarily by governments, culminated in mental health issues such as loneliness, depression, and social isolation (Ghasemi, Sedigh, and Hosseini Pourian Chabok 2022).

As COVID-19 spread across Iran, people began to live in quarantines which entailed many psychological, social, and economic implications (Kalantari, Zarei, and Abdolahi 2023). The COVID-19 pandemic caused many changes with accessibility, social gatherings, lifestyles, and working environments (Navaratnam et al. 2022). This disease caused many problems for households and changed people's lifestyles. Although these conditions improved during the post-coronavirus era, parts of which remained as internal behaviors, and focus on controlling the diseases and quarantine constraints engendered many complications during the post-coronavirus era (Gholami et al. 2022).

Changes in lifestyles and related complications led to this period being recognized as the post-coronavirus era. Large-scale research has recently investigated architectural design and urban planning strategies during the post-coronavirus era, with some research focusing on macro-economic problems (Mela 2023; Kushwah 2024; De Yong 2024; Baston 2022), and some others focusing on identifying and explaining the components affecting the architectural design of spaces, especially public and social spaces (McCulloch and McCulloch 2023; Zhou et al. 2024).

On the other hand, man could face similar or more advanced variants of Coronavirus in the future, and for this, the necessary measures should be taken to deal with this (Sharifi, Marooti, and Shabani 2021). Architects' and urban planners' measures to design public spaces and residential spaces will significantly contribute to preventing the transmission of pandemics. According to the crises arising from Coronavirus across the world, it is increasingly becoming critical to review criteria and standards of designing architectural spaces and urban planning (Belanian 2021).

In a study, Salama (2020) proposed an inter-disciplinary theoretical framework for health security concerns during the post-coronavirus era by focusing on three key aspects: urban dynamics and impacts of transportation in urban areas on the spread of disease, social distance and impacts of the public perception of the urban environment on the prevalence of disease, and adapting to evolving lifestyles and working styles that concern compatibility with changing lifestyles and a combination model of work and life. These three aspects underscored the need for developing and implementing encompassing security concepts and strategies not only in urban designing but also in architectural designing processes (De Yong et al. 2024).

Architecturally, designing and constructing gardens,

terraces, and green rooftop systems could reduce and eliminate isolation-related problems. Also, considering ceilings as the fifth element of buildings and designing green rooftops could be associated with positive outcomes. Following quarantine measures and spending much time at home, it is critical to help improve the quality of air and focus on ventilation, more natural illumination, and a reduction in toxic waste by combining plants and natural materials (Arabani and Bavari 2020).

Using natural sunlight, along with artificial lighting of high quality, could well influence physical and mental health. Because quarantine measures may be associated with mental outcomes, it is imperative to design high-quality ceiling windows, openings, and balconies and to provide artificial lighting (Ghasemi, Sedigh, and Hosseini Pourian Chabok 2022). It is also essential to pay attention to the ventilation and air filtering systems during a pandemic because these systems will prevent the inflow of polluted air indoors and contribute to reducing air-transmitted viruses (Seyed Charmchi and Qorbanzadeh 2021).

Today, smartization is increasingly becoming a key subject in all sectors; under specific pandemic circumstances, however, it is important that measures be taken to reduce tactile contact with equipment and openings, such as controllable elevators using mobile phones and automatic doors using face recognition systems (Navaratnam et al. 2022). Also, embedding thermal and temperature sensors to control ambient temperature and thermal fluctuations could increase the positive impacts of smartization (Ghasemi, Sedigh, and Hosseini Pourian Chabok 2022). Artificial intelligence can effectively and continuously surveil interior air quality and other environmental indicators while serving as a tool to prevent pollution (Naglaa et al. 2021).

The choice of materials is also a key subject, as the type of materials resistant to viruses and the time at which viruses may live will affect the choice and type of building materials (Seyed Charmchi and Qorbanzadeh 2021). Copper and brass, in particular, are more resistant to viruses and can be applied in making door and window handles (Qorbanzadeh and Jalili 2020; Navaratnam et al. 2022). Also, it is suggested that anti-microbial paints and UV-filtered glass be used on rooftops.

The literature has shown that multi-functional and flexible furniture and equipment are key elements under certain conditions. By the time of quarantines, functional spaces should be capable of allowing for the practice of different activities, due to the reduction of traffic and the spread of diseases among members. For this, adjustable and flexible furniture can serve as a working and entertaining space for the interaction of members, especially during social distancing processes (Ghasemi, Sedigh, and Hosseini Pourian Chabok 2022).

Table 2: Architectural Components under Pandemic Conditions

Components \ Researcher	(Abedi, Mortezaei 2021)	(Qasemi 2010)	(Asabi-Bakhshkandi 2010)	(Ahmadi, Zamani 2010)	(Ghorbanzadeh, Jalili 2010)	(Balanian 2021)	(Arabani, Bavar 2010)	(Qasemi, Sediq 2022)	(Seyed Charmchi, Ghorbanzadeh 2021)	(Asadi, Mojtabavi 2022)	(Sharafat, Sadeghian, 2022)	(Ranjbaran, Borujerdinla 2022)	(Khadir, Rezaizadeh Mahabadi 2021)	(Sobat-Sani, Nasrullahi 2021)	(Behzadpour, Hosseini 2022)	(Baqeri 2022)	(Ali A. Alraouf 2020)	(Mohammad Bettaieb 2020)	(Zandiyeh, Mahdavinejad 2022)
Resiliency	*		*			*		*	*	*	*	*	*	*	*	*	*	*	
Garden Green Spaces	*	*	*	*	*	*	*			*	*		*	*	*	*	*		*
View and Landscape	*	*	*	*				*		*	*				*		*		*
Terraces	*		*	*	*	*	*	*		*			*	*	*	*			*
Green Rooftop				*		*	*			*				*	*	*		*	
Utilizing Plants					*		*	*		*		*		*		*	*		
Natural Ventilation						*	*	*	*	*	*		*	*		*		*	*
Virus-Resistant Natural Materials					*		*	*	*	*	*		*	*	*				*
Making Space and Furniture Multi-Functional	*	*				*		*		*		*					*	*	*
Natural Lighting						*	*	*	*	*	*		*	*	*	*		*	

Components \ Researcher	(Abedi, Mortezaei 2021)	(Qasemi 2010)	(Asabi-Bakhshkandi 2010)	(Ahmadi, Zamani 2010)	(Ghorbanzadeh, Jalili 2010)	(Balanian 2021)	(Arabani, Bavar 2010)	(Qasemi, Sediq 2022)	(Seyed Charmchi, Ghorbanzadeh 2021)	(Asadi, Mojtabavi 2022)	(Sharafat, Sadeghian, 2022)	(Ranjbaran, BorujerdinIa 2022)	(Khadir, Rezaizadeh Mahabadi 2021)	(Sobat-Sani, Nasrullahi 2021)	(Behzadpour, Hosseini 2022)	(Baqeri 2022)	(Ali A. Alraouf 2020)	(Mohammad Bettaieb 2020)	(Zandiyeh, Mahdavinejad 2022)
Smartization		*	*	*		*		*		*	*			*		*	*		
Bicycle Riding Networks	*	*	*	*		*	*				*		*	*		*			*
Sidewalk Widening		*		*		*					*		*		*	*	*		*
Security				*						*						*			
Reduced Density						*					*			*	*				
Fewer Floors					*	*			*		*					*			
Accessibility								*		*							*		
Vitality and Vibrancy																	*		
Ceding Public Places to the Public not to Cars				*							*								
Safe Walking	*			*		*	*												
More Elevators					*				*		*								
Spaces being more Private									*		*			*					
Dressing Room									*		*		*						
Spatial Diversity																	*		
Enlarged Lobbies						*					*								
Partitioning Rooms						*												*	
Stairway Widening						*					*								
Taller Ceiling													*						
Personal Working Space									*	*									
Paints/Colours					*					*									
Creativity	*																		
Sense of Place and Identity									*										
Promoting Environmental Quality			*																
Transparent Divisions												*							
Glass Working Pavilion/ Plexiglass Walls						*													
Privacy										*									
Controlling Cooling and Heating										*									

2.3. Relationship between Architectural Components Increasing Social Interaction and Components Preventing the Prevalence of Coronavirus

In urban spaces, social interactions have always been a key design subject. During Coronavirus, public participation decreases, and consequently, social interactions are eliminated; for this, urban designers need to review and redesign urban spaces to restore social integrity (Pirbabayi et al. 2022). Urban spaces are expected to be reproduced relatively differently (Safaei 2021).

In his study "New Ordinary or Forgotten Ordinary: Challenging the Impacts of Covid-19 on Contemporary Architecture and Urban Planning", Al-Raouf (2021) concluded that under pandemic conditions, social cohesion and integrity are highly important (Ghasemi, Sadiq, and Hossein Pourian Chabok 2022). Social distancing, in the meantime, should not culminate in social separation (Pirbabayi et al. 2022). In architectural spaces, there should be a solution to deal with this problem. During the post-coronavirus era, contemporary architecture and urban planning have met with many challenges; for this, to increase social interactions during the post-coronavirus era and public space functionalities in the event of a new pandemic, increasing social interaction components and architectural components during the Coronavirus era were compared, which led to two types of classification, namely conflicting and common components.

Conflicts: Concerning architectural components increasing social interactions and components dealing with Coronavirus, the components of mixed land use, spatial integrity, increased density, and sociability were not compatible with Coronavirus conditions. To meet this challenge, there should be some resiliency to make spaces usable and increase social interactions in the post-coronavirus era. In the study "Urban Design Following a Pandemic: A Balance between Social Distancing and Social Interactions in the Constructed Environment", Ranjbaran and Boroujerdi-Nia argued that a non-resilient design was the cause of negative impacts affecting mental health during the pandemic era. For this, architectural design should be resilient enough to meet and adapt to epidemic conditions.

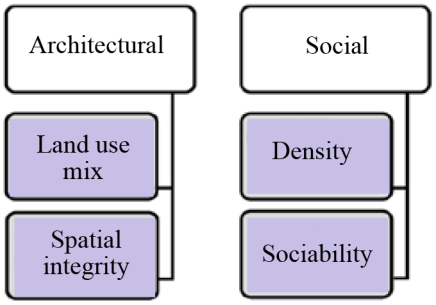

Fig. 1. Conflicting Architectural Components to Increase Social Interactions and Components to Deal with Coronavirus

Commonalities: Concerning components increasing social interactions and architectural components dealing with Coronavirus: meeting such components as privacy, accessibility, virus-resistant natural materials, resiliency, climatic comfort (natural ventilation and controlling cooling and heating), appropriate and natural lighting, security, appropriate and multi-functional furniture, taller spaces, vitality, view and landscape, greenery, the sense of identity to place, facilitating and prioritizing pedestrian traffic, and spatial diversity could also increase social interaction and maintain space functionality.

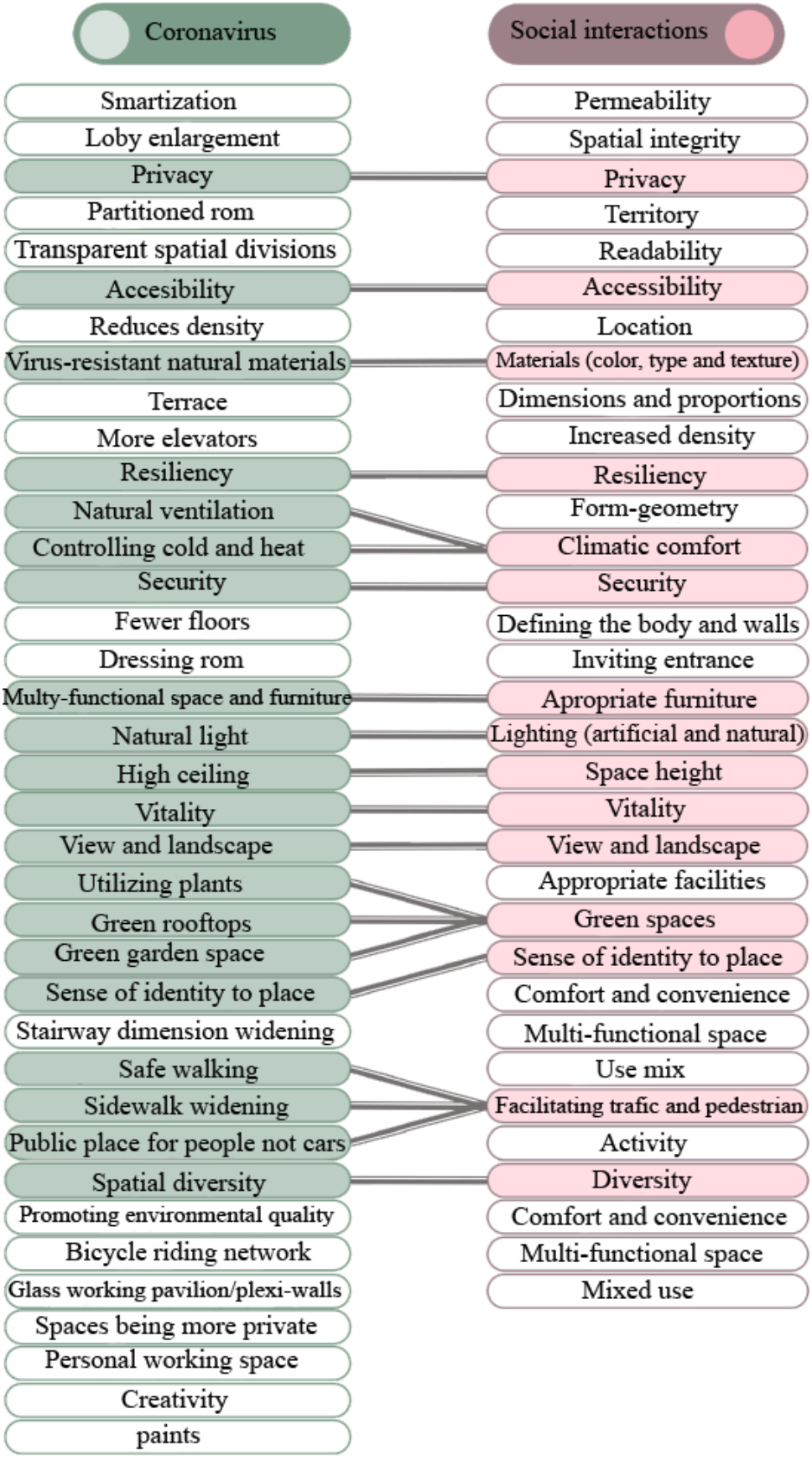

Fig. 2. Common Architectural Components Increasing Social Interactions and Dealing with Coronavirus

3. METHODOLOGY

This study fell under a mixed qualitative-quantitative method. In the first step, using the descriptive and analytical method, the literature was reviewed to extract components increasing social interactions and architectural components dealing with Coronavirus. Then, these two categories of components were compared which yielded the following results:

- Common components: Privacy, accessibility, virus-resisting natural materials, resiliency, climatic comfort (natural ventilation and controlling heating and cooling), natural lighting, multi-functional furniture, taller ceilings, vitality, view and landscape, greenery, sense of identity and place, facilitating and prioritizing pedestrian traffic, and spatial diversity
- Conflicting components: Mixed use, spatial integrity, increased density, and sociability

In the second step, the survey method was used to prioritize common architectural components to increase social interactions and deal with coronavirus. In so doing, the common components, extracted from the literature (the conceptual model of the study, Fig. 2), were used to design a five-value Likert scale questionnaire for a sample of 100 medical and architectural experts. The sampling procedure was performed using cluster sampling and the sample volume was estimated to be 2.5 to 5 times the number of the questionnaire's questions, as suggested by Klein who found this value to be adequate for the sample volume. Data were analyzed by SPSS software. Table 6 below gives the researcher-made questionnaire questions, with 1 assigned the lowest and 9 the highest scores.

Table 3: The Questionnaire

Questions	1	3	5	7	9
Do you think the sense of territory and space privacy would help increase social interactions during the Coronavirus and post-coronavirus eras?					
Do you think easy access to space would help increase social interactions during the Coronavirus and post-coronavirus eras?					
Do you think natural materials (wood) would help increase social interactions during the Coronavirus and post-coronavirus eras?					
Do you think virus-resisting natural materials (e.g., brass and copper) would help increase social interactions during the Coronavirus and post-coronavirus eras?					
Do you think resiliency would help increase social interactions during the Coronavirus and post-coronavirus eras?					
Do you think natural ventilation would help increase social interactions during the Coronavirus and post-coronavirus eras?					
Do you think thermal comfort, especially controlling heating and cooling, would help increase social interactions during the Coronavirus and post-coronavirus eras?					
Do you think security would help increase social interactions during the Coronavirus and post-coronavirus eras?					
Do you think space multi-functionality and internal furniture would help increase social interactions during the Coronavirus and post-coronavirus eras?					
Do you think natural light would help increase social interactions during the Coronavirus and post-coronavirus eras?					
Do you think taller spaces (elevated ceilings) would help increase social interactions during the Coronavirus and post-coronavirus eras?					
Do you think vitality would help increase social interactions during the Coronavirus and post-coronavirus eras?					
Do you think view and landscape would help increase social interactions during the Coronavirus and post-coronavirus eras?					
Do you think plants would help increase social interactions during the Coronavirus and post-coronavirus eras?					
Do you think green rooftops would help increase social interactions during the Coronavirus and post-coronavirus eras?					
Do you think gardens and green spaces would help increase social interactions during the Coronavirus and post-coronavirus eras?					

Questions	1	3	5	7	9
Do you think the sense of identity in place would help increase social interactions during the Coronavirus and post-coronavirus eras?					
Do you think safe walking would help increase social interactions during the Coronavirus and post-coronavirus eras?					
Do you think widening urban sidewalks (to maintain the physical distance) would help increase social interactions during the Coronavirus and post-coronavirus eras?					
Do you think ceding urban streets to people rather than cars would help increase social interactions during the Coronavirus and post-coronavirus eras?					
Do you think spatial diversity would help increase social interactions during the Coronavirus and post-coronavirus eras?					

4. FINDINGS

The validity of the questionnaire was first confirmed by two experts and its reliability was then confirmed by Cronbach's alpha coefficient of 0.864, which was validated using Cronbach's alpha test (Table 4). This indicated that the questionnaire was reliable as the value was higher than 0.7.

Table 4: Cronbach's Alpha

Reliability Statistics	
Cronbach's Alpha	No. of Items
0.864	21

Table 5 gives the demographic data of respondents.

Table 5: Frequency of Demographic Variables

Variable	Grouping	Frequency	Variable	Grouping	Frequency	Variable	Grouping	Frequency	Variable	Grouping	Frequency
Sex	Female	84	Education	PhD	50	Specialty	Physician	48	Age	20-25 Years	22
	Male	16		M.A	50		Architect	52		25-30 Years	29
										30-35 Years	16
										35 +	33

A test was used to prioritize components. The significance value was smaller than 0.05, suggesting the test was significant (Table 6). Table 7 below uses the Friedman Test to show the order of architectural components increasing social interactions and dealing with Coronavirus in cultural spaces during the Coronavirus and post-coronavirus eras.

Table 6: the Friedman Test Statistical Results

N (Sample Number)	100
Chi-Square	267.751
Df	20
Asymp. Sig	<0.001

Table 7: Statistical Results of Prioritizing the Architectural Components Increasing Social Interactions in the Post-Coronavirus Era and Dealing with the Virus in the Coronavirus Era in Cultural Spaces through the Freidman Test

Components	Average Rank
Ventilation	14.40
Garden and Greenery Spaces	14.06
Security	12.98
View and Landscape	12.71
Using Plants	12.46
Natural Lighting	12.39
Resiliency	12.09
Accessibility	11.79
Vitality	11.55
Sense of Identity	11.31
Multi-Functional Furniture	11.18
Spatial Diversity	10.95
Safe Walking	10.91
Higher Ceilings	10.61
Therma Comfort	10.49
Sidewalk Widening	10.24
Green Rooftops	10.11
Ceding Streets to People	8.61
Privacy	8.11
Natural Materials	7.81
Virus-Resisting Materials	6.28

The average values of the components showed that ventilation, garden and green spaces, security, view and landscape, using plants, and natural lighting with average values of 14.40, 14.06, 12.98, 12.71, 12.46, and 12.39, respectively were prioritized by medical and architectural experts to increase social interactions and deal with Coronavirus in cultural spaces during the Coronavirus and post-coronavirus eras, respectively.

5. FINDING ANALYSIS AND CONCLUSION

To answer the main study question "How are the architectural solutions of cultural spaces prioritized to help strengthen social interactions during the Coronavirus and post-coronavirus eras?", the architectural components affecting social interactions, which were regarded to be critical elements based on the changes made to the lifestyle during the post-coronavirus, were first extracted. Then, the architectural components dealing with Coronavirus, which would help maintain the functionality of cultural spaces during the re-emergence of a pandemic, were extracted.

The comparative investigation of these two categories of components led to the extraction of common and conflicting architectural components increasing social interactions and dealing with the Coronavirus in cultural spaces. Concerning common components, as stated by the objective of the study, they were prioritized by medical and architectural experts who offered a design solution for the category that took priority. Except for security, the top five common components, which helped increase social interactions in the post-coronavirus era and prevent the disease in the Coronavirus era to help cultural spaces serve as places for sociability, fell under the category of environmental components. Topping the list of common components, ventilation appeared to have a special importance in the Coronavirus because it was ventilation that helped deal with the prevalence of a disease that could be transmitted through the air. On the other hand, the literature has investigated indoor air quality, signifying the importance of this subject during the Coronavirus. Design solutions related to this component included the optimal location of openings facing each other, and the proper orientation of the building against the wind, which could help realize natural ventilation. Moreover, using plants and

vegetation could also serve as a design solution to both provide thermal comfort and produce fresh air without interior pollution. Second in the list of common component ranks was the component of green spaces that have an impact on mental health This component is highly associated with other components such as ventilation, security, and view and landscape, among others, while promoting them indirectly. The proposed solutions related to this component included individual and group green spaces for all tastes under all conditions, and embedding a terrace with a green space that would serve as a space for product cultivation. All these solutions were aimed at reducing environmental pollution and increasing individual and group interactions. Moreover, the green wall solution not only helped improve the green space but also improved two other components, namely view and landscape. Put simply, the solutions related to those components could improve other components indirectly, thereby being considered as solutions taking priority. Occupying the third rank was the component of security falling under the category of social components. The solutions related to this category included 24-hour land uses that affected both nightlife and consequently, social happiness and social interactions. Security can also help distribute more time at longer time intervals and keep social distances better during pandemics. Observing safety standards, particularly for sensitive groups, such as children and their parents, could pave the way for more security, and consequently higher social interactions. Concerning view and landscape, the view-of-nature solution was proposed which fell under the components of green space and ventilation. Also, the view-of-the-crowded street component could stimulate the sense of community and encourage people to engage more in social interactions. The component of natural lighting (illumination) was also provided through wall and ceiling openings. This lighting not only affects mental health and social interactions but also prevents the spread of the virus through ventilation. Using the balcony could also secure appropriate lighting by providing green spaces and natural scenery which would meet the objectives of increasing social interactions and mental health with the pandemic in the post-coronavirus era.

Two conflicting components, including mixed use and spatial integrity, were actually serving social interactions but were not compatible with Coronavirus, though. While the component of mixed-use helped increase the number of people, it was not suitable for the Coronavirus era but could increase social interactions in the post-coronavirus era. The design solution proposed for this problem included separate accesses for functions and spaces, as well as the divisibility and separation of those functions through resilient epidemic conditions, with each function serving independently. In the post-coronavirus, spatial integrity positively increased interactions but could make the prevalence of the pandemic even higher through air particle transmission in the Coronavirus era. To tackle this problem, spatial resiliency helps design a movable, sliding, and folding space under epidemic conditions to maintain spatial integrity during the post-coronavirus. Finally, Table 8 below gives the solutions designed as the main results of the study.

Table 8: Design Solutions related to Common and Conflicting Architectural Components Increasing Social Interactions in the Post-Coronavirus Era and dealing with the Virus in the Coronavirus Era in Cultural Spaces

	Architectural Components		Description	Design Solutions
Common Components	1. Ventilation		- Providing thermal comfort - Providing fresh air and reducing pollution	1. Using plants 2. Using openings and windows facing each other 3. the building's proper orientation
	2. Green Space	Garden Green Spaces	- Positive effects on health - Visual and mental satisfaction - Reducing mental abnormality - air filtering	1. Embedding individual and group green spaces for all tastes and under all conditions 2. Using plants in the interior design 3. Providing green walls 4. Embedding a terrace 5. Providing a space for product cultivation
		Using Plants and Vegetation		
	3. Security		- Lack of security causes isolation - Providing social happiness - providing a mental sense of security in space - Increasing spatial surveillance	1. Lack of safety threats for people, especially for children 2. Night life and 24-hour space
	4. View and Landscape		- Positive effect on the somatic and mental health	1. View of nature 2. View of a crowded street (reducing depression and maintaining a sense of community)
	5. Natural Lighting		- Positive effect on the somatic and mental health	1. Using wall openings 2. Using ceiling opening 3. Using the balcony and view 4. Combining natural and artificial lighting

	Architectural Components	Description	Design Solutions
Conflicting Components	1. Mixed Use	- It is suitable for space during the non-Coronavirus era. During Coronavirus: Mixed use that increases the number of people would not be appropriate. - It is suitable for increasing social interactions during the non-Coronavirus era.	Spatial resiliency helps design a space that would account for the needs of the Coronavirus and post-coronavirus eras. 1. Predicting separate accesses for functions and space s 2. Providing divisibility and separation under epidemic conditions, enabling each function to serve independently Focus on design particulars such as color, material, texture, and lighting
	2. Spatial Integrity	During the Coronavirus: Spatial integrity causes the diseases to be easily transmitted through the air.	Spatial resiliency helps design needs 1. Providing a movable, sliding, and folding space under epidemic conditions to maintain spatial integrity during the post-coronavirus

Concerning the component of natural ventilation, ranked first on the list of components, the findings of this study corresponded to other research that proposed developing a theoretical framework for architects to apply ventilation systems in the design process and to deal with Coronavirus. This study emphasized employing static design strategies that would adapt to local climates and use the lowest amount of energy. The study found that the appropriate circulation of the wind, the building's proper orientation, and the proper design of openings and spatial syntax could lead to sustainable architecture while tackling pandemic problems (Naglaa A. 2021). The findings of this study were also in line with those of the research that proposed providing vertical gardens and interior green spaces to deal with Coronavirus (Navaratnam S. 2022). Concerning resiliency proposed to resolve the conflicting components the findings were found to be similar to those of another article suggesting that space syntax and survey methods could apply resiliency as an effective way to deal with Coronavirus at student dormitories, which is a public space (Boroushaki B. et al. 2024).

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The authors have no conflicts of interest to declare.

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The authors commit to observe all the ethical principles of the publication of the scientific work based on the ethical principles of COPE. In case of any violation of the ethical principles, even after the publication of the article, they give the journal the right to delete the article and follow up on the matter.

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The authors state that they have directly participated in the stages of conducting research and writing the article.

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