

ARCHITECTURAL IMPLICATIONS OF PUBLIC LIBRARY DESIGN AND ENVIRONMENT FOR USERS' MENTAL HEALTH

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Abstract— This paper focuses on the architectural impact of public libraries' environment on users' mental health. This study also investigates appropriate criteria and patterns and identify environmental stimuli in life space and their effects on humans and then evaluate environmental indexes. Present study was conducted through unique and innovative research method and tools to examine architectural effects of public library on user's mental health in all depended public libraries in Tehran (Capital city) of Public Libraries' institution of Iran. A 41-item checklist is designed by the researchers, which provides standards, criteria and patterns for indoor and outdoor space of public libraries. This study examines via descriptive-survey method and two types of quaternaries were used as assessment tools: General Health Questionnaire (GHQ) and researcher-made questionnaire based on architectural theories. The results indicate that architectural space of public libraries is effective on users' mental health. This research study confirms that there is a significant relationship between architectural implications and characteristics of public libraries and users' mental health

Index Terms— Public Library, Architectural elements, Mental health, Environmental health care, Health Seeking Behavior, Adolescents, Students, India

I. INTRODUCTION

One of the main reasons for the creation or development of public spaces and buildings is to provide current and potential human activities. Architecture and design is a set of techniques and skills that considered as intermediary between human and the environment that created while forming living spaces.

If human made environment can be connected to his mental totality, then the function and structure of building as a shelter and a place to stay need a coherent design and planning hence the environment in response to human needs can grow, change, evolution and adaptation (Eynifar, 2000). Proshansky who is one of the pioneers in environmental psychology suggested that buildings and their architectures are social phenomenon as much as they are physical phenomenon, and because of physical and emotional mechanisms, space created

its certain psychological impact on consumers and affects the psychological nature of human and causes different behaviors in humans (Proshansky, 1987).

Also, environmental studies suggest that our responses to the physical environment and architecture can be described according to our desire to getting close or away from that environment (Mehrabian, 1976). If the environmental elements do not have the capability to meet behavioral patterns of individuals, environmental adequacy are minimized and people take sides from it and abandon the environment (Lang, 2012).

The emotional evaluation of the physical environment-architecture leads us to avoidant-tendency behavior and these emotional states have a direct impact on our mental performance (McAndrew, 2012).

Because public libraries' environment is a space where include omnipresence of man that take all aspects of individual and social life of human. Therefore, regarding studies of environmental psychologists it can be stated that the library environment design without noticing the users' needs and psychological issues of users, in addition to depriving security and comfort, will lead to escape users from the environment (Madanipour, 2000).

Thus, the physical environment must support the expected needs of library users and physical space nature of libraries should be designed in such a way that current patterns of behavior achieved in these places.

Accordingly, the physical environment-architecture of public libraries is one of the factors that with a correct and proper layout can adds its dynamicity.

In fact, improving space and architecture of public libraries requires an understanding of the spatial structure, materials and components, order and balance, its interior layout and attention to its green space and other requirements

- Form and Shape of space
- Facilities for entry of disabled people into building
- Space to pause and sit in outer space of library
- Landscape and green space

that Salehi (2008) mentioned these factors as environmental elements of a desirable space.

Bentley et al. (2003) are also suggested an index of key factors including accessibility, legibility, permeability, neighborhood, robustness, balances, attraction, visual appropriateness, shape and form of structure as space qualities.

On this basis, regarding concepts and factors suggested by architecture and design experts (Lynch, 2013; Barker, 1965; Gehl, 2009; Lang, 2013; Ajami, 2006) utilizing the principles of architecture, art and environmental psychology in designing public spaces; moreover to creating calm and comfort atmosphere will lead to presence of users with serenity, vitality and enough motivation in these spaces and will minimize stress and mental pressures caused by living in industrial and mechanical life in users.

Also, according to the statement of Library's Space Conferences in Iran (2009), the goal of library architecture should be creating a space that provides easier, respectful and pleasant access to facilities and services of library; And in fact, in architecture of libraries, physical space design should not be considered as the only goal, but also pay attention to environmental psychological aspects of the space plays a decisive role in designing of that space and guaranteed its user's comfort (Bahreyni, 1998).

Generally, in the current study, the various factors and dimensions in designing buildings of the libraries from the psychological aspects of architecture which is the proper interaction between 'man and the built environment' is discussed. Mentioned dimensions and factors include the interior and exterior of public libraries' buildings that will be discussed and analyzed according to criteria that architecture and design experts considered in designing public spaces.

II. RESULTS AND DISCUSSION

A. *Effective factors in architecture and design of exterior space of Public Libraries*

Factors and regulations of designing exterior space of public libraries includes:

- Location and accessibility
- Neighborhood
- Attractive exterior
- Legibility
- Robustness
- Balance

B. *Accessibility and Location*

Libraries described as a democratic space; therefore, one of the environmental capacities of public libraries is to provide physiological comfort for people with different movement abilities includes senior citizens, children, and disabled people (people on wheelchair, blinds) that can access its physical environment without any barrier (Lang, 1987) and invite all members of family to use spaces and resources of that. Accessibility factor regards this point that place is accessible to whom and how and is one of the most important factors in improving quality of a place (Kaar, 1999).

Gehl (2009) suggests that the effect of factors such as distance, quality of road, and transportation condition plays an important role on presence of people in public spaces. Gehl has also derived from his research's findings regarding distance and borrowing books that people whom residential location is nearer to library borrow most number of books.

C. *Neighborhood*

Bentley et al suggested that surrounding areas and neighborhood usability in development of cultural and public spaces is of the most important indicators in lay outing construction of such buildings. Also, compatibility and lack of compatibility between usability and neighborhoods of a place has a great impact on presence of people in that place. (Bentley et al, 2012).



Figure: 1 View of the entrance of Public Library of Kan martyrs, Tehran



Figure: 2 View of Houston Sensible Oak Forest Library Neighborhood

As seen in above pictures public library of United State with utilizing green space has an inviting and pleasure environment while public library of Kan in Tehran because of neighborhood has an undesirable condition.

Environmentfigure researchers' studies show that (Osmond, quoted from Mortazavi, 2001; Parto, 2007) neighborhood of public libraries with educationfigure, culturfigure centers, public parks and green areas, moreover to recognizing the face of these places, it figureso caused emerging user behavior patterns and smoothen socifigure communication environment of people. Therefore, avoidance of these places from neighborhood with industrifigure usages, smell generating, noise creating, waste dumping site, cemeteries, slaughterhouses and railways are noticeable points in positioning public libraries.

D. Attraction of exterior design (Form and exterior design of libraries building)

Visual figures and attractive exteriors of buildings helps to create a sense of place and encourage people in a space (Gehl, 2011). Figure no.4 shows qufigureity specifications of exterior in outer space of Cedar Rapids Public Library in Spain and Kansas City Public Library in United States compared to exterior of Figurelameh Tabatabayee and Kan Martyrs public libraries in Tehran.

Regarding mentioned views of experts in architecture and urban planning filed, exteriors that place surfaces, colors, lights and textures together in an order creates cfigurem and desirability sense in human (Lang, 2012).



Figure: 3 Exterior of a public library in Tehran, Iran



Figure: 4 Exterior and entrance of Allameh Tabatabayee and Kan Martyrs Public libraries in Tehran city, Source: Author.



Figure: 5 Exterior of Cedar Rapids Public Library in Spain and Kansas City public library in United States, Source: Library Journal.

E. Legibility of Entrance Space of Building

Legibility means the ability to simply recognize components of a place or a city and connect its elements in mind and in an interconnected format. (Bentley Et. al, 2012) In places with that have some kind of legibility components of it can be recognized or imagine all of its elements in an interconnected set.

Lynch (2006) asserted that landmarks and signals in detection and recognition of cities and places has a specific importance.

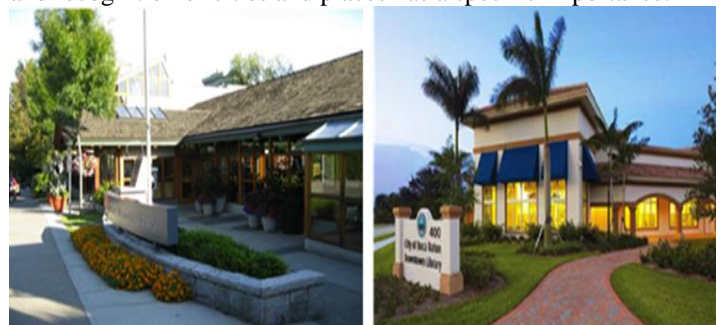


Figure: 6 Legibility with landmarks and signs in exterior spaces of Central Memorial Library of Canada, source: American Library Association, 2014.

As seen in above figure, landmarks and signs have been used in designing public libraries in Canada for recognition and legibility but in designing and architecture of public libraries of Tehran city, the value of this criteria specify an undesirable rate and lack this important specification.



Figure: 7 Exterior of Resaalat Public Library in Tehran city,
Source: Author.

F. Space for Children and Teenagers

As it can be seen in the above pictures of the children section of Public Libraries in Denmark, France and California through utilizing attractive colors, suitable furniture, proper lightening and equipping this section with toys provide a motivation for presence of children in public libraries while public library of Daneshjoo Park in Tehran, moreover that its children section has an undesirable condition, it has no facilities and equipment for children.



Figure: 8 Children section of Bonneuil Sure Marne, France, source: American Library Association, 2014.



Figure: 9 Best new public library in the world in Denmark 18 August 2015, Resource: Designing Libraries./

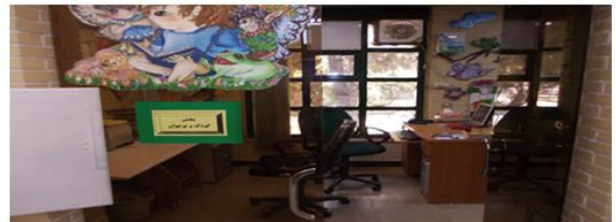


Figure: 10 Children and Teenagers section of Daneshjoo Public Library in Tehran city, Source: Author.

Studies show that one of the important functions of public libraries is to provide playground for children. Minimizing area of residential units and from one hand and needs of children to play with their peers from the other hand increase their presence in public libraries space (Ashari, 2012).

G. Effective Factors in architecture and interior design of public libraries

Architecture and interior design of public libraries' space is a set of knowledge, technology and art that through relevant factors such as form, colour, texture and other elements tries to optimize spaces and achieves efficiency and proper functioning along with the aesthetic sense. The goal of interior design is to improve physical and mental performance space for comfortable living of the inhabitants in that space. (Seyed Sadr, 2011) Architecture and interior design of public library's space is advised as one of the important topics to attract users and invite them. McCabe (2003) pointed that libraries' buildings should be attractive and desirably beautiful for users and this attraction should be along with functionality and support technological services. These factors in architecture of interior space include furniture, and sensitive visual elements such as colours, textures, and lightening. Therefore, mixture of

these factors with mentioned criteria creates interior environment that these criteria includes:

- Entrance of Library
- Lobby
- Standards and human scale
- Height of ceiling
- Doors and windows
- Lightning of library
- Acoustic design (noise adjustment)
- Color (spaces and equipment)
- Flooring
- Furniture element
- Cooling and heating system
- Moisture level
- Air conditioning
- Safety and Security
- Access points and circulation paths in interior spaces
- Comfort and relaxation in interior spaces
- Coffee shop
- Parking
- Drinking water tank
- Washing rooms suitable with users' ability

H. Rules and General Criteria in Space and Interior Architecture of Libraries

The rate of desirability of rules and general criterions in space and interior architecture of libraries is investigated.

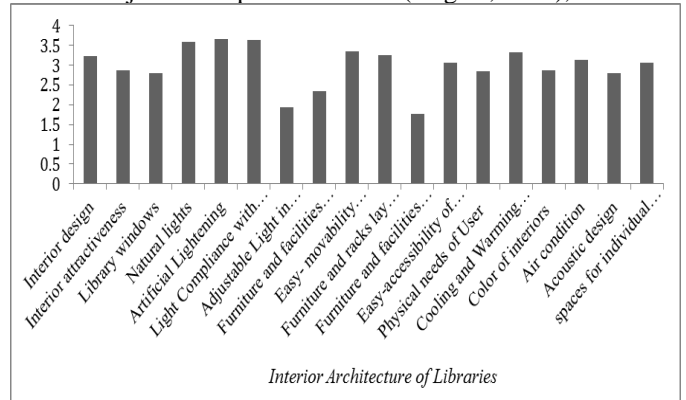


Figure: 11 the rate of suitability and desirability of Rules and General Criteria in Space and Interior Architecture of Libraries

Figure 11 shows the rules and general criteria in space and interior architecture of libraries two criteria of “Artificial Lightening” and “Compliance of light with user eyesight” are evaluated as desirable for respondents. While, “Adjusting light ability in reading hall” with average of 1.95 is one of the criteria having least desirability rate and “Furniture and facilities for senior citizens” criterion with 1.76 desirability rate is also have the minimum desirability rate to respondents.

Table 1 shows the descriptive findings of desirability and suitability of design and architecture of public libraries variable and mental health variable. The number of respondents, minimum and maximum achieved point, average and standard deviation are reported.

Table 1. Descriptive Findings of Architecture Desirability and Interior design of public libraries and mental health variable

Variable	No.	Minimum	Maximum	Average	Standard deviation
Architecture and interior design of public libraries	15 3	1.29	4.70	2.90	0.58771
Mental health	15 3	2.00	36.00	19.69	6.54888

The impact of design and architecture of public libraries can predict metal health is one of questions of this study.

Table 2. Impact-coefficients of regression: independent variable^a on dependent variable^b

Model	Sig	R	R square	Adjusted R2	Standard Error of estimation
1	0.002	0.244	0.060	0.054	0.57176

- a. Architecture
- b. Mental health

Table 2 shows the effects of regression coefficients' related results, which include a correlation coefficient of the regression (R), R square, Adjusted R Square, and standard Error in the effectiveness of architecture of public libraries on mental health.

The correlation coefficient (R) between two variables equals to 0.24 and R square (value of similar changes of two variables) and also Adjusted R Square equals to 0.05. I.e. 0.06 (6% percent) of mental health is predictable through effects of library architecture. Standard error of present estimation equals to 0.57, which shows the power of regression equation.

Table 3 *Standardized and non-Standardized results of effective regression coefficient of independent variable and dependent variable*

	Non-Standardized regression coefficient		Standardized regression coefficient	t	Sig
	B	Std. Error	Beta		
Fixed Value	2/469	0/147		16/811	0/000
Architecture	0/022	0/007	0/244	3/098	0/002

Table 3 also includes some information such as Regression coefficient (B), Standard deviation Error (std. Error), Partial correlation coefficients (Beta), T Value (t), and Level of confidence (sig.).

As shown in Table 3, the first statistic record is Fixed Value (constant), which intercepts the value of dependent value (mental Health) without interfering independent variable (when independent variable of architecture equals to zero). Statistic t shows the relative effectiveness of the variable. Whenever the constant value of this statistic is larger than 2.23 for the variable, the value of its error level was also less than 0.01 and the mentioned variable poses statistical meaning in explaining the changes of dependent variable i.e. it is also significant here. Non-Standardized regression coefficient and Standardized regression coefficient can be observed (see Table 3). Adjusted regression coefficient can help the researchers to determine the portion of independent variable in predicting dependent variable. As shown in the table 8 of standardized regression coefficient of 0.24 equals to in error level of less than 0.01; then, it is significant.

3. Conclusions

The results indicate that there is a significant relationship between the desirability and suitability rate of design and architecture of public libraries belong to “public libraries of Tehran city body” with mental health of these libraries users.

Secondly, physical environment variables, public libraries' building architecture and unsuitable physical condition of public libraries including nonstandard and inappropriate entrances, lack of welfare facilities outside of libraries and in open area, lack of accessing outer space through windows and balconies from inside spaces, sound pollution, inappropriate lightening, utilizing repeated boring colours, lack of noticing thermal comfort and flooring, lack of noticing physical and mental needs of children, teenagers, senior citizens and people with disabilities in architecture and design of general space of public libraries, lack of noticing furniture and internal equipment, lack of notice to wash rooms in terms of hygiene and security, lack of designing spaces for meeting the members in libraries and other factors which are mentioned in the findings of study indicate the significance of this study. Thirdly, the architecture of environment and space of public libraries as a biological space from psychological perspective is considered as a basis for user's behaviour. Therefore, the obtained results from this study considering confirm environmental weaknesses and its effect on users in findings section of this study made the necessity of revision and noticing designing and architecture of spaces of public libraries much more clearly and a special attention of authorities is required for development and improvement of public libraries.

Considering findings and results and done discussion, regarding the importance and effect of characteristics of public libraries' physical space on behaviour and mental functionality of users, spaces of these places should be defined functional and designed with certain characteristics. The most important factors of architecture should be followed in creating these spaces with a purpose of security, health, mental and physical comfort of users should be in top strategies in designing and planning of these spaces.

Accordingly, it is suggested utilizing familiar elements, expected order, appropriate lightening, acceptable heat, utilizing associated colours with the same family tonalities (white, blue, green, purple), noticing green area and fountains in libraries, noticing geographical location and accessibility, removing move barriers inside and outside spaces of libraries, utilizing attractive structures in designing public libraries, clearness and visibility of building of library, noticing permeability, harmony in the components and elements of public libraries' building do not only increase a positive function and environment power of public libraries but also provide a basis for possibility of memes and day to day activities of all users and play an important role in increasing mental health of users. The architectural standards of present study are introduced which are derived from guidelines of ISO 7730, standard National Institute of Building Sciences of America and New South Wales public library for revising and redesigning architecture and spaces of public libraries reduce

noticeably the stimulant effects of environmental stressors of these spaces.

In addition, call for papers and holding workshops on architecture and design of public libraries and physical and mental needs of users can be useful to develop and improve these spaces. Finally, this study provides a new framework to promote users' mental health in designing. The physical environment of public libraries can help in better understanding of users' needs. It also plays a vital role as a start point for interdisciplinary discussion in environmental psychology and architecture of public libraries and mental health. Preliminary research demonstrates the health benefits of sustainable communities. However, the impact of mediating and moderating factors within the built environment on health must be explored further. Given the complexity of the built environment, understanding its influence on human health requires a community-based, multilevel, interdisciplinary research approach.

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