

The Role of Architectural Design in Supporting the Requirements of Users with Intellectual Disability

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Abstract

Architecture is mainly concerned with establishing an appropriate environment that enables individuals to live in a comfortable environment. The problem of people with an intellectual disability is in movement from one place to another and lack of skills with the surrounding environment as he/she depends in most cases on individuals or assistive devices and to be able to deal in a more flexible way in public and private spaces like government buildings, markets, recreational and service buildings and other buildings that may be frequented by, it is required to achieve an architectural technical standards related to services located in those places in terms of their positions, dimensions and required spaces. Design considerations are divided into physical problems; mental, behavioral, mobility, hearing, visual, and psychological needs (intimate atmosphere - containment - privacy - simplicity and clarity - ease of movement - colors). Egypt sought through years of time to provide support and requirements that work on the care and rehabilitation of the disabled and allocated. So, many agencies and institutions that serve those requirements such as youth and the labor force and the Ministry of Education, health and housing. A study was conducted on the current situation of a building that deals directly with individuals with intellectual disability (Suez Canal Authority Capacity Center) and evaluated that data and knowing the strengths and weaknesses points based on what has been extracted from standard design considerations. These considerations could be taken into account as guidelines for the decision-makers through setting and enforcing the legislation.

Keywords: Psychological Needs, Physical Problems, Behavioral Problems & Mental Problems.

Introduction

There are undeniable efforts from both The Egyptian Authorities and International community in developing the Egyptian regulations for human rights protection. By casting light on the hardships Egypt confronts regarding the discussed issue, it can be found that according to the statistics provided, the percentage of the disabled people is about (10-12%) of the total

Egyptian population. By analyzing the given numbers, it is apparent that the mental disability occupies the highest percentage (22.4%) which represents 1.6 million Egyptian citizens and about 450 million disabled people all over the world. It is worth mentioning that these statistics are witnessing a continuous increase causing a serious problem in the upcoming period⁽¹⁾. Mental disability is perceived as one of the extremely hazardous hardships that could

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be encountered by the community. Its direct effect is manifested in the decline of the mental work performance level to the point that makes it one of multiple deficiencies, such as: hardships in acquiring different skills which are essential for the individual's living and co-existing in order to successfully interact and adapt with the surrounding environment. Undoubtedly, there are multiple forms of intellectual disabilities. In other words, the disabilities do not come to a halt at a particular form that the diseases and syndromes vary between (down syndromes, autism, epilepsy, Alzheimer, and so on)⁽²⁾. Through the symptoms and problems confronted by that particular people, come the role of the architect and urban designer to help in the issues concerned with the movement of the handicapped with no barriers. This can be done by searching for methods that ensure the interaction of the remaining senses in order to prevent any kind of external aid. The architect can also discover solutions for light and sound sensitivity, distraction, concentration deficiency and hardships in speaking. All of which, make it extremely difficult for them to communicate properly in order to satisfy their needs. It is needless to say that no progress shall be achieved in the existing buildings or the new constructions for the handicapped without the government's aid. This should be done through enforcing policies that help in decision making and powerful plans from all the society's

individuals to help them to integrate into it.

Research Problem

Despite the abundance of research directed to the fundamentals of architectural design standards in buildings in order to fulfill the needs of the handicapped. However, the design processes are still lack the main sides that satisfy the needs of the intellectual disability in particular. This could be noticed thoroughly in Egypt, as the Egyptian code for the disabled has neglected the intellectual side which consequently led to the complete isolation of those people and the failure to develop their skills optimally. As a result, we find that this issue is in a serious need for further research and study not only in Egypt, but also in global organizations aiming to ameliorate human rights and eliminate the discrimination among the members of society. The research problem can be summarized as follows: *"Deficiencies in the performances of existing buildings and new ones that satisfy the needs of the intellectual disabled in Egypt."*

1. Definition:

According to the WHO definition of disability: its impairment. Something biological or physical has happened which causes a difference. It's the lack of being able to function in assumed, normal ways. Thus, one may not be able to walk, think as quickly or clearly or to see.

Table 1: The difference between intellectual disability and mental illness⁽³⁾

	Mental Illness	Intellectual Disability
Diagnosis	Disturbances in the processes of thinking and perception. The patient may suffer hallucinations and delusions.	Cognitive ability is limited. Because of the level of mental functioning.
Medical History	It may be permanent, temporary, or recurring over periods of time.	It lasts forever, even if that person has undergone various treatment methods.
Onset of The Disorder	It may occur at any time of life.	It often occurs before the age of 18 years.
Treatment	The patient responds to medical treatment to control symptoms. Psychiatrist deals with them more than psychologist.	Medical treatment cannot restore cognitive ability. Psychologist deals with them more than psychiatrist.

Table 2: The most important personal characteristics of the intellectually disabled⁽⁴⁾

Personal Features	Intellectual Features
<ul style="list-style-type: none"> - Inability in self-direction. - Constant frustration of failure situations. - Feeling of frustration and inefficiency leads to aggressive behavior towards others to attract attention. - Delayed language development and difficulties in speaking. 	<ul style="list-style-type: none"> - Lack of cognition and impaired ability to distinguish between things. - Inability in thinking and impaired memory and imagination. - Lack of attention and always they need to attract their attention and alert them to what is going on around them.
Social Features	Mobility Features
<ul style="list-style-type: none"> - Lack of tendencies, interests, responsibility. - Inability in social skills. - Not fully realizing the consequences of behaviors. - Difficulties in making friends and social isolation. 	<ul style="list-style-type: none"> - Extremely slow performance of some movements or difficulties in coordination. - Some cases suffering from hyperactivity, collision with objects, and disturbances in field regulation (right, left, up ... etc.).

2- Intellectual disability includes the following disorders:

Mental Retardation, Autism. Attention Deficit Hyperactive Disorder (ADHD), Alzheimer Disease and Cerebral Atrophy. The problems of people with intellectual disabilities are shown in table 3.

3- Psychological Needs:

For a normal person to interact with the space, he must understand it and be able to define all directions in this space. Thus, one of the most important difficulties facing the designer in meeting the needs of people with intellectual disability is that the space must be friendly and uncomplicated. So that he/she can deal with it despite his lack of capabilities or defect in some of his senses. Among the most important psychological needs are: (Intimate atmosphere, containment, privacy, simplicity and clarity, ease of movement, colors and texture)⁽⁶⁾.

4- Development of Mental Health Facilities over the ages:

- a) *Before Birth:* They were rudimentary attempts to find out what symptoms associated with mental illness and attempts to explain its phenomena first through magic and sorcery, and secondly medically. They did not pay attention to any engineering aspects to care with patients.
- b) *The Nineteenth Century:* Families repudiated their patients and were dis-

placed on the streets, so, governments threw them in prison and shackled them. The idea of asylums began to appear to protect them, but there were insufficient experiences to deal with, they were severely abused⁽⁷⁾.

- c) *The Twentieth Century:* Medical knowledge expanded, and an actual model of the mental health facility has developed and created by the Englishman William Tuke and the Frenchman Philippe Pinel, then Thomas Kirkbrid adopted this approach and wrote a series of official statements on the standards of asylums. He designed a building model that has been applied in a wide range over the next few decades.
- d) *Beginning of The Twentieth Century:* In the 1950s, some cities began a new trend of healthcare facilities and a new curative model had emerged, which is called the hospital complex including the psychopathic hospital and outpatient clinics. After that, many researchers in engineering fields conducted research in mental health facilities and setting standard dimensions that are appropriate for the uses of the mentally disabled, and these are followed by legislation that has been applied in some countries⁽⁸⁾.

Table 3: The most important personal characteristics of the intellectually disabled⁽⁵⁾

Problems	Mental Retardation	Autism	ADHD	Alzheimer	Cerebral Atrophy
Mental Problems	Low intelligence level.	Intelligence level may be low or geniuses.	————	Deterioration in intelligence.	- Deterioration in intelligence.
Behavioral Problems	- Impaired Attention. - Poor concentration- Difficulties in speaking.	- Impaired attention and/or hyperactivity. - Poor concentration. - Difficulties in speaking. - Aggression. - Spin around himself.	- Impaired attention and/or hyperactivity. - Impulsive behaviors.	- Forgetfulness and it may cause danger. - Quick tempered and aggressive.	- Perception difficulties. - Quick tempered.
Hearing Problems	————	- Loss or shortage of hearing. - Sensitivity of hearing sounds.	Disturbances of loud sounds.	Impaired hearing.	Sometimes there are problems in hearing that may leads to its loss.
Visual Problems	- Sensitivity to light in some cases.	Some cases suffer from the inability to control the eyeball movement.	————	Impaired visual condition	- Sensitivity to light in some cases. - Eye problems.
Mobility Problems	- Mobility impairment. - Short stature. - Imbalance in movement.	-Insufficiency in the balance and movement of the hands. - Muscle disorder; spastic state or stiffness. - Limb deformation.	- Collisions with objects and disturbances in the organization of the field.	- Imbalance in movement. - In some cases, they are a bed-ridden or in a wheelchair.	-Epilepsy and cramps. -Impaired balance and coordination of movements. - Muscle relaxation. - Movement disability (hemiplegia or quadriplegia).

5- Architectural design aspects for mental health facilities:

By studying the most important elements of architectural design for spaces that deal

with intellectual disability in accordance with their medical conditions, whether Physical or Psychological and the effect of that on the Design Process (Figure 1).

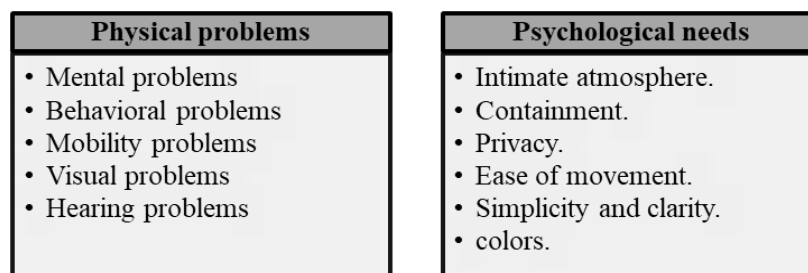


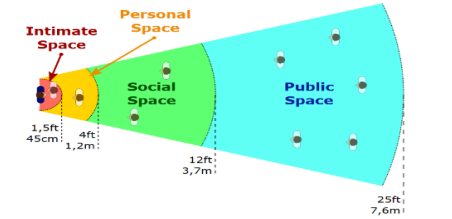



Figure 1: The fundamental of problems and needs that must be considered in architectural design process.

5.1 Psychological Needs:

<p>a. Intimate Atmosphere.</p> <ul style="list-style-type: none"> - Buildings must be like their surroundings, and there is nothing to distinguish them from the rest of the buildings in the surroundings. - Study the psychological and physiological impacts of designing internal surfaces and materials used in mental health facilities. - Avoid designs that produce heavy shadows, as this causes blurred vision (Figure 2). - Air conditioners must be used for every disabled room and be away from central ventilation, due to the temperature difference from one patient to another. - Paying Attention to natural elements and choose the appropriate sites for them. -- Considering that playing is an important factor in education and behavioral modification⁽⁹⁾. 	 <p>Figure 2: The effect of Shading Louvers on internal spaces, causing visual discomfort.</p>
<p>b. Containment.</p> <ul style="list-style-type: none"> - Space proportions widely affect the feelings of its users, especially those who suffer from intellectual problems because of deficiencies in the sensory system. -- Spatial closure has a role in the visual identification of the space and helps to reduce dispersion and to focus due to the lack of details and the surrounding visual stimuli⁽¹⁰⁾, (Figure 3). 	 <p>Figure 3: The spatial closure of an inner courtyard.</p>
<p>c. Privacy.</p> <ul style="list-style-type: none"> - Trying to stay away from open spaces because of their lack of privacy. Consider the personal spaces (Figure 4). -- Room must achieve good personal privacy, whether it is audio privacy or visual privacy⁽¹¹⁾. 	 <p>Figure 4: The personal spaces between a person and the people around.</p>
<p>d. Ease of Movement.</p> <ul style="list-style-type: none"> - Each place should be visually different from the other. - Avoid crossroads and use signs to guide users. - Never design one or two steps when changing the level because it may be not seen and missed, and for stairs, steps should have two contrasting colors. - Provide a seat that can be folded inside the elevator, for individuals who suffer from problems with balance⁽¹²⁾, it's preferred to design elevators that opens in both directions (Figure 5). 	 <p>Figure 5: The elevator is designed to be opened in both directions to facilitate the movement of wheelchair users, so they do not have to rotate to be able to get out.</p>

e. Simplicity and clarity.

- Psychological feeling of calmness is achieved when the senses are not stimulated too much. And that includes the design plan, the distribution of furniture and details (Figure 6).
- Space may have a specific and clear shape that is easy to recognize, and it may be indeterminate in a multi-faceted and multi-directional shape that is difficult to recognize. This diversity of space shapes affect both visually and psychologically on the users⁽¹³⁾.



Figure 6: the scope of simplicity and clarity for the inner courtyard.

f. Colors.

- Colors affect our perception of volume differently than it really is.
- The texture affects the perception of colors, the smooth texture reflects the light and the color appears bright, which gives a feeling of wideness.
- Change colors for different functions, and avoid visual disturbance with color⁽¹⁴⁾, (Figure 7).



Figure 7: contrasting colors to attract attention.

5-2 Physical Problems:**a. Mental Problems.**

- Using smart systems that are integrated into the building (Figure 8).
- Using smart phone applications that support services could help patients with mental problems⁽¹⁵⁾.



Figure 8: the Snoezelen room at the Treatment and Intervention Center in Dubai.

b. Behavioral Problems.

- Using interactive floors with human movement.
- Columns in the middle of the space should be avoided to prevent collision.
- Avoid any corners in walls or in interior furnishing and turn them into smoothing corners to avoid injuries (Figure 9).
- It is possible to provide a radiation system passes under the bathrooms floor, which leaves it dry all the time.
- Design barriers and fences in a way that does not expose intellectually disabled to trap his head in those openings.
- Covering walls and floors with flexible materials that absorb shocks (Figure 10).
- Door-Top Pressure Sensitive Alarm could be installed on the top edge⁽¹⁶⁾.

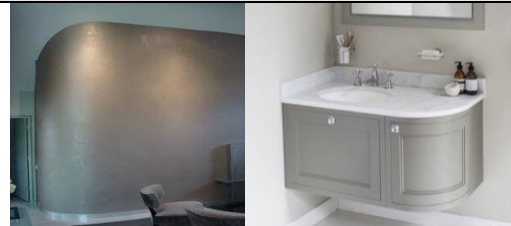




Figure 9: smoothing corners in walls or in interior furnishing.



Figure 10: a playing room coated with foam for intellectually disabled to avoid shocks.

c. Mobility problems.	
<ul style="list-style-type: none"> - Pedestrian paths should be free of any obstacles, such as drainage units. - It is preferable to provide windows with low sill. - The slope of the ramps should not be more than 1:20 and design a landing if its length exceeds 9 m even if it is a swimming pool (Figure 11). - The dimensions of the bathroom must not be <math><1.5 \times 2.2 \text{ m}</math>, and the distance between the door and the toilet must not be <math><1.5\text{m}</math>. - Providing places for the handicapped in the conference halls by 2%⁽¹⁷⁾. 	 <p>Figure 11: the swimming pools are provided with a slope and immersed seating decks for the disabled or elderly to sit on.</p>
d. Visual problems.	
<ul style="list-style-type: none"> - Provide handrails on both sides, and in case the width exceeds 1.70 m, it preferred to put a handrail in the middle of the staircase. - Floor warning signs to alert the start and end of the stairs or crossroads, this can be accomplished by changing the texture of the floor, (Figure 12). - Provide audible media as an optical guidance to serve the blind⁽¹⁸⁾. 	 <p>Figure 12: floors with different patterns that used as a warning language.</p>
e. Hearing problems.	

- The noise level between 55-75 dB is suitable for the normal people, while the noise level for people with intellectual disability ranges between 25-45 dB, so it is necessary to provide a quiet atmosphere within their facilities.
- The design of the ceiling affects the acoustic quality of interior spaces, especially in large open spaces.
- Cladding walls and floors with flexible and porous materials to absorb sound.
- Integrate the hearing loop system in the design (Figure 13).
- Separate the spaces that need quietness from all noise causes inside the building⁽¹⁹⁾.

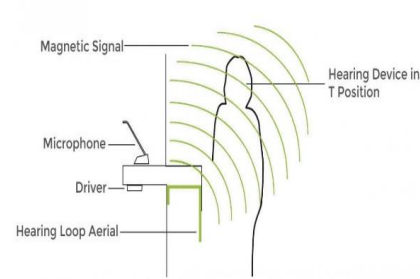


Figure 13: A hearing loop system that works by providing a direct link to a sound source for example a microphone, television, or sound system. The sound is picked up by a microphone, converted to a magnetic signal by amplifier which is then transmitted towards a user via hearing loop aerial.

Study Recommendations

The research targeted to achieve a comprehensive view of the architectural design of buildings that deal with intellectually disabled, which include (mental retardation, autism, ADHD, Alzheimer's, Cerebral atrophy), as well as studying the current situation in Egypt and evaluate its performance to know Egypt's position

among the global level. However, after the study, it is important to present some recommendations that would raise the efficiency of building performance in Egypt and reach a level that enables us to keep pace with the global progression during the coming period. These Recommendations are as follows:

a) Recommendations for Architects and Designers:

- Cooperate and share opinions with doctors and psychologists to know more about people with intellectual disabilities and their needs from the building, and also try to involve them during the design process, to come up with a design that takes into account their medical, psychological and architectural design considerations.

- Designers should not overlook the security and safety element to protect its users with intellectual disabilities and those around them.
- Attempting to take advantages of international experiences and scientific research of such types of buildings before starting to prepare the design.
- Get acquainted with smart systems and applications, as they can create an interactive environment that attracts their attention and help them in carrying out their daily requirements.

b) Recommendations on the national level:

- Develop policies and legislations related to buildings for intellectually disabled users, as the Egyptian Code for the Disabled completely neglects the mental aspect, in addition to not developing the code to match the current technological developments.
- Raising awareness among caregivers about the available services, such as the curative, educational, training, and rehabilitative care programs.
- Develop the current situation in buildings that deal with the intellectually disabled according to the international guidelines as an attempt to develop these buildings

in new ways to raise their performance.

c) *Recommendations on the educational and academic level:*

- Instruct architecture students to consider designing spaces that are suitable for intellectual disability users according with their all problems and needs, as it's an essential basics for architectural design, and NOT a choice.
- Study and develop the concept of “social sustainability” to reach a balanced and normal environment, socially and psychologically.
- Train students in specialized technical companies in smart control systems, in addition to the Smart material manufacturing companies, and conduct lectures and seminars under the umbrella of the architectural departments and those companies.

d) *Recommendations for new researchers and future studies:*

- Regularly updating the guidelines that have been reached in the research and adding any new standard that may affect increasing support in the requirements of users with intellectual disability.
- Creating an evaluation tool for the buildings that deal with intellectually disabled approved by the designer engineers, psychiatrists, users, and their caregivers, and applying it to a group of buildings to prove its effectiveness as an evaluation tool.
- Creating a simulation model that shows the performance of the building before and after applying of the guidelines that have been reached and studying the effect of this building on the performance of its users and their interaction.

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