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Original Research Article

Analysis of Accessibility of Green Spaces in Tehran for People with Limited Movement with an Emphasis on the Concept of Universal Design

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Abstract

Problem statement: Urban parks have a great impact on people's physical and mental health. Today, despite the global importance of inclusive design, research, and related criteria in Iran, people with limited mobility are less present in parks due to the unavailability of parks. It seems that this issue is due to insufficient technical knowledge of designers, supervisors of urban and civil designers, disregard for the rules and also ignorance of the physical condition of people with limited mobility.

Research objectives: The purpose of this study was to evaluate the accessibility of parks in Tehran for people with physical limited. This evaluation is done with an emphasis on the concept of inclusive design so that all people, regardless of their physical abilities, can benefit from the facilities and equipment available in the parks.

Research method: First, through theoretical studies, the characteristics and limitations of movement of different people in society were identified. Then the physical and non-physical principles of the concept of inclusive design were examined.. In the next step, the equipment in the parks was identified and the availability indicators were determined by the experts. In the third stage, a case study evaluation checklist was prepared and completed through a survey. Data analysis by Delphi method and the results, after extracting points and weighting options through Excel, were plotted and analyzed.

Conclusion: The results show that several factors cause the unaccessibility of parks that are effective in the design, implementation and operation stages.. The most important of these factors are ignoring the principles of inclusive design, ignoring design criteria for people with physical disabilities, lack of knowledge and sufficient technical knowledge of contractors in the correct implementation of projects, and creating secondary obstacles after implementation due to improper management.

Keywords: *Accessibility, Green Spaces, Urban Parks, Universal Design, Limited Movement.*

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Introduction

To make urban spaces including parks more accessible to all members of society, such as children, the elderly, and people with disabilities it is necessary to consider the physical ability of all people in the design and construction of urban green spaces. Physical barriers should not prevent the independent and active presence of people with visual impairments and movement in the environment and their enjoyment of living facilities (Gehl, 2015, 121). Because all people have the right to lead a safe social life equally without the need for the help of others, and to meet their environmental needs in daily affairs. The absence and activity of this important part of society leads to a decrease in the vitality of the spaces (Pakzad, Tarkzadeh, Ghasemi & Torabi, 2014, 145). Therefore, it is necessary to pay attention to providing equal opportunities for all members of society to use the available facilities and in accordance with their physical and sensory needs (Bedla, 2005, 4).

The purpose of this article is to evaluate the availability of parks in Tehran for people with disabilities with emphasis on inclusive design. Because today, despite the importance of comprehensive design in the world and the existence of applied research and related rules and regulations in Iran, there is no accessibility in urban spaces, especially parks.

The present study includes the following steps:

- Presenting theoretical concepts of research in the field of accessibility,
- Provide a global definition of inclusive design and its physical and non-physical indicators,
- Assessing the ability and sensory and physical limitations of individuals,
- Determining the availability indicators of parks and scoring them by Delphi method, with the help of adaptation, planning, research, design and implementation specialists,

Then 22 case samples of Tehran parks were selected and their evaluation checklist was

completed and the necessary photos and sketches were prepared in order to identify the existing barriers and the availability of parks.

Finally, after summarizing, the proposed solutions are presented in order to make the parks accessible.

Research questions

The present study answers the following questions:

- 1- What are the criteria for assessing the availability of urban parks for the easy and safe movement of people with physical and sensory impairments?
- 2- What measures should be taken to make urban parks accessible to people with disabilities?

Research background

Various studies have been conducted on the availability and adaptation of different spaces (office, residential, public spaces, pedestrians, etc.) for people with physical disabilities, and each has presented the existing limitations and adaptation methods.

Some of the most important ones are as follows:

Nozari et al. have conducted a study with the aim of providing methods for adapting office buildings for people with limited movement. In this study, the most important managerial and human factors that limit access to office buildings are as follows:

- Lack of attention to , negligence and inconsistency of officials regarding the provision of facilities, equipment and municipal services in order to respect the rights of individuals for easy traffic,
- Lack of attention of furniture and urban equipment designers to the needs and physical characteristics of people with disabilities,
- Lack of general and specialized knowledge of the features and how to apply the criteria of architecture and urban planning in terms of adaptation (Nozari, Rafizadeh & Ghasemzadeh, 2017).

Rafizadeh (2018) has conducted a study. to understand why the adaptations made on the sidewalks of Tehran are not desirable? The most

important reasons are the ignorance and lack of knowledge of designers about the ability of the disabled, intentional or inadvertent negligence of employers the problems of the disabled, the ignorance of contractors about the existing rules and lack of familiarity with the correct implementation of executive details appropriate to the physical condition of the disabled.

In this study, the most important social feedback of these factors are deprivation of individuals from independent and active presence in society, violation of citizens' citizenship rights in enjoying life facilities, impossibility of social relations that are formed in open urban spaces, deprivation of access to public facilities and lack of freedom of movement in daily life.

Ghasemzadeh (2004) in his article, the reasons for the inaccessibility of the environment for people with disabilities, the inattention of designers and controllers of projects to create obstacles in the design of urban spaces and pedestrians, unprincipled interference of people or organizations in charge of urban infrastructure and lack of monitoring of construction is known. Stach GÜNGÖR (2016, 496-512) says in a study on the evaluation of Konya Birlik Park in Turkey states, that attention to the physical characteristics of all people, including the elderly, the disabled, and especially children with disabilities should be considered in the design of parks and furniture and equipment located in it. So that all people can use all the spaces and facilities available in the parks, and the reason for not doing it in the parks is the designers' inattention to the conditions of people with limited mobility and ignoring the design criteria.

Human research society

A large group of people in society suffer from physical-motor and sensory limitations congenitally or during a period of life permanently or temporarily .According to the definition given in the second edition of the rules and regulations

of urban planning and architecture for people with physical disabilities, physically disabled refers to a person who for any reason has a weakness, disorder or inability in the sensory and motor organ (Rules and regulations of architecture and urban planning for people with disabilities, 1999, 11).

According to scientific definitions and rehabilitation ,physical disability is any physical disorder that limits one or more major activities in a person's life (Factsheet on person with disabilities, 2011) Thus ,a large group of people in the community are included, such as:

People who use wheelchairs for movement ,people who have mobility problems due to paralysis or rheumatism ,people who have visual impairments and need assistive devices in movement and orientation ,people who have hearing problems, people with osteoarthritis of the hands or feet, people who could not climb stairs due to heart disease ,people suffering from fractures and temporary disabilities as a result of accidents, pregnant women and the elderly .Therefore, it can be said that a wide range of people in society are somehow limited in movement, and this leads to restrictions on human interaction and access to public facilities, freedom of movement and the general way of daily life. (Nourani, 2006, 22). Table 1 shows people with mobility limitations who use some kind of assistive devices.

Review of theoretical concepts of research

• Universal design (Inclusive design)

The accessibility of the physical and urban environment and meeting the needs of the community at the international level is known as universal design. Inclusive design is a special approach in designing the environment and its elements in a way that is in accordance with the needs of people with gender, age and physical and sensory abilities that lead to equality and social cohesion (Preiser & Smith, 2011, 4-11).

The purpose of inclusive design is to produce products, to communicate, to design and build

Table 1. People with physical and sensory limitations, the extent of their limitations and the assistive devices used by them. Source: Rafizadeh, Nozari, Ghasemzadeh & Mandegar, 2017, 16. Adapted form Nourani, 2006.

People with limited mobility	Auxiliary device used	Type of movement limitation in the environment
Elderlies	<ul style="list-style-type: none"> - Use a cane or walker - Use of hearing aids - Use a wheelchair - Use of glasses 	<ul style="list-style-type: none"> - Lack of balance - Inability to cross a steep slope - Orientation problem - Inability to cross heights of more than 10 cm - Inability to cross open streams Impossibility of active and fast mobility - Difficulty crossing slippery surfaces - Difficulty using Iranian toilet. -Inability to read written information with limited resolution - Inability to hear vague sounds
People with disabilities	Disability in the hands	<ul style="list-style-type: none"> - Use of artificial hands - Restrictions on opening doors - Limits of maintaining balance
	Disability in the legs	<ul style="list-style-type: none"> - Using artificial legs -Using canes - Using a wheelchair - Active mobility restrictions - Inability to maintain balance - Inability to cross open streams - Restriction of crossing the iron stairs of the network - The problem of crossing uneven surfaces - Difficulty crossing a steep slope - Problem crossing slippery surfaces - Difficulty using public transportation - Inability to go up and down stairs - Impossibility to use Iranian toilet
	Disability in the limbs	<ul style="list-style-type: none"> - Use of electronic wheelchairs - Inability to maintain a balance - Inability to cross open streams - Difficulty crossing a steep slope - Problem crossing slippery surfaces - Difficulty using public transportation - Impossibility to use Iranian toilet - Impossibility to pass through doors with a width less than 80 cm -Possibility of falling due to the presence of any pit - Accessibility to cross sidewalks that are less than 90 cm wide.
Congenital shortness		<ul style="list-style-type: none"> -Lack of access to high levels -Inability to cross open streams - Difficulty crossing a steep slope -Inability to use public telephones - Inability to cross heights of more than 10 cm
The blind and the visually impaired	- Use of white canes	<ul style="list-style-type: none"> -Difficulty navigating and moving -Lack of ability to be aware of unforeseen obstacles - Inability to detect the path without tangible protrusions -Inability to use traffic lights without sound signals -Possibility of colliding with fixed or moving objects on the sidewalk
Deaf and hard of hearing	- Use of hearing aids	<ul style="list-style-type: none"> -Inability to hear any sound from behind and in front -Only the ability to use visual signs
People who are temporarily restricted in movement due to illness or osteoarthritis and an accident	<ul style="list-style-type: none"> -Use a cane -Use a walker -Use of a wheelchair - Without using an auxiliary device 	<ul style="list-style-type: none"> - Inability to go up and down stairs -Inability to cross open streams - Difficulty crossing a steep slope - Problem crossing slippery surfaces - Impossibility to use Iranian toilet -Active mobility restriction

spaces and equipment that can be used by everyone as much as possible, and to facilitate and improve the quality of life for all people at the lowest cost, to prevent independent and active presence (Mace, 1985, 147).

Inclusive design refers to the design of an environment in which children can play in complete safety, adolescents and women can

move without fear, people with any physical and sensory abilities, as well as the elderly can move without fear of falling and being injured.

In this design method, the emphasis is on meeting the psychological and physical needs of all members of society to minimize the limitations and disabilities of individuals. Otherwise, a group of people will always be discriminated against

and deprived of the facilities and conditions provided in the environment, the effect of which will be their gradual marginalization (Alalhesabi & Noorzian Maleki, 2008, 28-41).

Rodman and Frederick outline the following seven key principles for inclusive design: (Rodman & Frederick, 2009, 3).

- 1- The practicality of design and avoiding the separation of spaces in order to observe the principle of equal opportunities for people with different abilities.
- 2- Flexible design with the ability to consider a wide range of users with different physical abilities,
- 3- Understanding the designed environment for everyone, regardless of the level of experience, knowledge, speaking skills, or concentration of people and eliminating unnecessary complexities,
- 4- Understanding environmental information by creating different audio, video, and touch conditions for all people with different abilities by creating contrast, maximum readability of necessary information and providing the necessary instructions and criteria.
- 5- Minimizing the risks and predicting the permissible limit of error by creating a barrier-free environment, eliminating hazardous elements and creating danger warnings, creating maximum access and predicting safety measures.
- 6- Promoting ease of use and flexibility in the operation of the environment with the aim of minimizing repetitive functions for the use of all people with different abilities, and needs
- 7- Providing easy access to all spaces, elements, and equipment by using appropriate dimensions

and creating sufficient space without obstacles for all people with physical, age, and sensory abilities, In summary, the physical principles and non-physical of the comprehensive design can be expressed in Table 2.

Accessibility

Availability is one of the physical components of inclusive design principles. Accessibility means the possibility of independent use and without the need for help of people with limited mobility of urban environments, parks and physical spaces (Rafizadeh, 2013, 12).

The purpose of accessibility of the environment is to provide the possibility of independent movement in the city for all members of society and to create fair and respectful access to urban spaces and equipment.enable independent movement in the city and fair and respectful access to urban spaces and equipment (Herwing, 2008, 17).

The most important and necessary point in providing access is to maintain the continuity of the route from origin to destination. In simpler terms, “creating an accessible environment and enforcing access regulations in the environment are effective when it can create individual independence that is not interrupted at any point from origin to destination. Therefore, planning to make spaces accessible should be done step by step and simultaneously” (Nourani, 2006, 47).

Physical barriers are factors in a person’s environment whose presence or absence limits performance and causes disability, such as

Table.2. Physical and non-physical principles of inclusive design. Source: Rafizadeh 2018, 193, Adapted form Rodman & Frederick, 2009, 3.

Physical and non-physical principles of inclusive design	
Physical principle	Non-physical principle
<ul style="list-style-type: none"> -Functionality of the design -Avoid segregation of environment -Design flexibility -Readability and comprehensibility of environmental information -Create a barrier-free and safe environment -Facilitate access -Space security 	<ul style="list-style-type: none"> -Being fair -The same safety and security regulations -Understandable information and avoid unnecessary complications

inaccessible physical environment, lack of appropriate assistive technology, negative attitudes toward disability, non-existent services, or barriers. People with different health conditions live in different contexts (Disability and Health, 2005, 249).

Table 3 summarizes the general requirements for the availability of the environment and their feedback.

Elements of Parks

Parks are designed green spaces that have different uses and are part of people’s daily lives (Cohen, 2001, 87). These spaces are covered with plants and trees, created for public use and are a suitable environment for spending leisure time, sports, entertainment, and socializing with friends and... (Hekmati, 2014, 324). They are also a good place for children to play and the elderly to relax. Benches, lighting, toilets, playgrounds, and sports fields, public buildings with various uses such as libraries, teahouses and the like, as well as passages and accesses, are components of public green spaces.

Table 4 shows the common and necessary spaces and equipment in parks:

Field of studies

Understanding the context of the plan is the first step in studies, planning, and any intervention at the space level. Accordingly, after examining the parks in different areas of Tehran, according to the relatively similar characteristics of each such as location in the neighborhood, area more than one

hectare, normal slope and common topography of the land, local access, residents’ use and common local services, 22 parks were selected based on their locations on the map of Tehran (Table 5).

Accessibility components in urban parks

According to the physical and non-physical principles of inclusive design, physical limitations of people and the need for accessibility of the urban environment, the proposed criteria for accessibility of urban parks were determined. Then, through the prepared criteria, the availability of selected parks in Tehran was evaluated. According to the physical and non-physical principles of inclusive design, The proposed components were finalized with the help of experts and experts with experience in adapting the environment, which can be seen in Table 6. Selected experts include seven faculty members, three technical experts of Tehran Municipality and consulting engineers related to adaptation, two members of the urban environment adaptation staff (in the welfare organization) and also two members of the target group (people’s organizations Institution) were. These criteria make it easy for everyone to travel and access the facilities, equipment and public spaces of the parks. It also evokes a sense of individual independence, security and safety in the park environment.

Then, the availability components obtained from Table 6 were scored by the same experts using the Delphi method. Then, with the average views obtained on the weighting of each option, the average weighting of each option was presented

Table 3. General accessibility requirements. Source: Environmental accessibility and its implications for inclusive, sustainable and equitable development for all., 2013, 8-15.

Principles of accessibility	Feedback
<ul style="list-style-type: none"> - Maintaining the continuity of routes - Ensuring the safety of people - The possibility of easy access to all public spaces - Ability to access all spaces without the help of others - The possibility of using all public facilities for all people regardless of their ability 	<ul style="list-style-type: none"> strengthen self-esteem, motivation to strive and life expectancy - Development of active participation of people with physical and sensory limitations in different sections of society - Increasing the level of social status of people with disabilities through the acquisition of effective roles in society - Help to avoid the separation of different groups of society from each other by combining different aspects of life of all members of society with each other regardless of age, physical and sensory limitations

Table.4. Common spaces and equipment needed in parks. Source: Adapted from Baghaei, Okhovat, Lillian & Tashakor, 2011, 286.

Common spaces and equipment needed in parks	
Title	Contents
Sports equipment located on sports fields	Various play equipment for children, sports equipment for teenagers and young people such as table tennis, volleyball, basketball and football. Also special sports equipment for bodybuilding.
Public Buildings in Parks	Restaurant, toilet, coffee shop, library and the like
Furniture and equipment	Pavilions, benches, drinking troughs, trash cans and the like
Other	Signboards, statues and memorial signs, lighting and entrances

Table 5. List of selected parks to study their accessibility and location on the map of Tehran. Source: Author.

Regional	1	2	3	4	5	6	7	8	9	10	11
Name of Park	Golrizan	Shahrara	Shariati	Ghadir	Miaad	Honarmandan	Andisheh	Fadak	Almahdi	22Bahman	Daneshjo
Area (hectares)	1/5	1/6	4	6/5	3	6	3	4/5	7	2/5	3
Regional	12	13	14	15	16	17	18	19	20	21	22
Name of Park	Parke Shahr	Pirozi	Sahand	Golchin	Bahman	Baharan	Ghaem	Velayat	Behesht	Narges	Sahel
Area (hectares)	2/5	7	5	2	15	6	4/5	70	1/5	3	17

Table.6. Accessibility components (i.e. physical and non-physical) in urban parks. Source: Author.

Accessibility components	Physical components	Physical components in parks
- Safety	- Sufficient width of sidewalks - Barrier-free routes - Use of color contrast - Suitable flooring, durable, smooth and non-slip in parks.	- Lack of physical barriers - No level differences - There is a suitable and standard ramp - Suitability of entrance width and sidewalks - Use of suitable and non-worn materials - Existence of special routes for the blind
- Sense of security	-Adequate lighting of parks -Path continuity	- The possibility of children, adolescents, youth, and the elderly to use play and sports equipment
- Sense of individual independence	-Path continuity - Standard slope with handrails -The level of routes, entrances and ...	- The possibility of using furniture and stationary equipment in parks - Use of visual and sensory signs and symptoms
- Possibility of orientation	-Adequate tactile and sensory signs and Symptoms - Use of color contrast	

in Table 7, so that a score of ten is the most desirable sign and a score of zero indicates the weakness of the component. Then, for each of the components and their sub-measures, based on the prepared questionnaires and average weighting, and with the help of Excel software, diagrams were prepared to determine the availability of each of the components and the following criteria, which can be seen in Fig. 1.

Research method

In this research, The data has been obtained through review of existing documents and criteria

and case evaluation. The purpose of analyze was to the current situation and assess the problems and technical factors affecting the lack of proper implementation of the rules and the inability of people to access the parks and equipment and facilities in them. To achieve this goal, were selected from each area of Tehran Municipality. In the process of conducting survey studies, first two separate checklists were prepared, one to check the accessibility of the entrance, traffic routes, play and sports spaces and pavements flooring of the routes, and the other for buildings, toilets , and administrative centers of the parks. The

Table 7. Options for weighting the components of the availability of the studied parks based on the opinion of experts. Source: Author.

Components	Accessibility components of the studied parks (based on experts' opinions)																						Average weighting
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	
Entrances																							
- No physical barriers in front of the entrance (pots, security bars, doors, chains, etc.)	10	10	2	0	0	0	0	0	0	0	2	0	6	0	0	6	0	0	10	5	8	10	3/13
- No level difference between sidewalk and entrance	1	5	1	6	0	5	0	1	0	0	8	10	5	7	0	8	0	0	10	0	5	0	3/17
- Existence of standard and suitable ramps	0	0	0	0	0	2	0	0	0	0	2	-	8	-	0	0	0	0	-	5	0	0	0/77
- Suitability of input width (more than 100 cm)	10	10	10	10	10	10	10	10	10	10	8	10	10	10	10	10	10	10	10	8	10	10	9/8
Footpaths																							
- No level difference on the sidewalk	10	2	0	3	0	0	0	7	0	10	0	10	5	8	5	8	5	5	10	8	10	0	4/36
- No physical obstacles on sidewalks	9	3	1	5	0	5	5	1	0	0	8	5	8	8	8	8	8	5	10	8	8	5	5/36
- Appropriate width of sidewalks	8	8	8	10	10	8	7	8	10	5	10	10	10	10	10	7	10	10	10	10	10	10	9/04
- No longitudinal and transverse slopes	0	3	0	8	10	5	5	5	0	10	0	10	5	8	2	8	5	10	10	10	10	0	5/68
- Using standard ramps with suitable handrail bars in case of surface differences	2	3	0	0	0	0	2	0	3	0	0	-	5	0	0	0	5	0	-	-	-	0	0/90
- Use of suitable and non-worn materials in the routes	8	7	8	8	9	5	5	7	5	8	8	1	8	8	7	8	8	8	10	8	8	0	6/95
- Existence of a special route for the blind	0	0	8	0	0	0	0	5	5	0	0	0	0	5	3	3	0	5	0	0	0	0	1/94
Sports and play spaces																							
- Proper flooring suitable pavement	10	10	10	10	10	5	10	7	10	10	8	8	8	10	8	8	10	5	8	8	10	5	8/54
- Do not create obstacles or level differences to enter the game and sports space from the sidewalk	10	0	0	10	10	5	10	5	8	5	8	8	8	10	8	10	10	8	5	5	10	5	7/18
- Do not create obstacles with sports equipment on the sidewalk	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
- Ability to use play equipment for children with disabilities	0	0	10	10	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1/13
- The possibility of using sports equipment for people with disabilities	0	0	0	10	8	5	5	7	8	0	5	8	5	5	5	5	5	5	5	5	5	5	4/82
Toilets																							
- The possibility of entering the toilet building due to the lack of surface differences, low entrance width and other obstacles	0	5	10	10	10	0	10	0	10	10	2	0	0	8	3	0	7	0	5	0	3	5	4/45
- Suitable width of interior corridors	10	0	10	10	10	10	10	10	10	10	8	10	0	10	10	10	10	10	10	8	10	10	8/90
- Suitable width of toilet openings	5	0	5	8	0	8	8	0	0	0	0	0	10	8	8	5	0	0	0	0	10	0	3/18
- Existence of special health services for people with disabilities	0	0	10	10	0	0	10	0	3	10	1	0	0	0	0	0	0	5	0	0	0	0	2/18
- Existence of Western health service	0	0	10	10	0	0	10	0	10	10	2	0	0	0	5	5	0	5	5	0	0	5	3/7
- There is enough space inside the toilet space	0	0	10	10	0	0	7	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0	1/45
- Existence of a suitable handrails	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
- Suit the sink for the use of wheelchairs	0	5	0	0	0	0	0	0	10	10	5	5	5	8	8	5	10	8	5	5	8	8	4/77
Public Buildings																							
- No level difference and unsuitable ramps for pedestrian access to the building	1	8	7	6	0	0	5	0	7	2	0	0	0	5	0	3	5	5	0	-	0	-	2/45
- Suitable entrance width of the building for wheelchair users	10	10	10	10	8	10	10	10	10	10	10	10	10	10	10	10	10	10	10	-	10	-	9
- Existence of suitable internal openings for travel	8	10	10	10	8	8	8	10	10	10	10	10	10	10	10	10	10	10	10	-	10	-	8/72
Fixed furniture and equipment (pavilions, benches, drinking fountains, ...)																							
- Do not create obstacles on the sidewalk	10	8	7	10	10	10	10	10	0	10	10	10	10	10	10	10	10	10	10	10	8	10	9/68
- Use suitable benches with handles	10	7	7	5	10	10	10	10	10	10	10	10	10	8	5	10	4	0	10	10	8	5	7/81
- No level difference to access the equipment	5	0	1	0	0	2	8	0	0	5	0	0	0	0	2	0	0	0	10	0	8	-	1/86
- Ability to access all people to drink	0	8	0	8	0	0	10	6	0	0	0	0	0	7	0	0	0	0	5	3	7	-	3/36
- Forecast the free space in front of the equipment	4	1	1	5	0	1	8	7	5	2	2	0	0	8	5	0	0	0	10	5	8	0	3/27
Visual and sensory signs																							
- Use signs and signboards at the right height	5	5	5	5	0	5	5	5	5	5	5	8	5	5	5	5	8	5	5	5	8	3	5/63
- Use of visual, olfactory, auditory and tactile signals,	5	5	0	0	0	0	0	0	5	5	5	5	2	5	2	2	3	3	3	0	5	0	2/5
- Proper lighting to detect signs	7	8	3	7	0	5	10	0	10	10	5	2	2	10	3	10	10	5	0	8	5	0	5/45

checklists were prepared on the criteria of urban planning and architecture for people with physical disabilities (Urban and Architectural Design

Criteria for People with Disabilities, 1999). and its guide book (Rafiezadeh et al. 2017), which are the only official authorities in this regard.

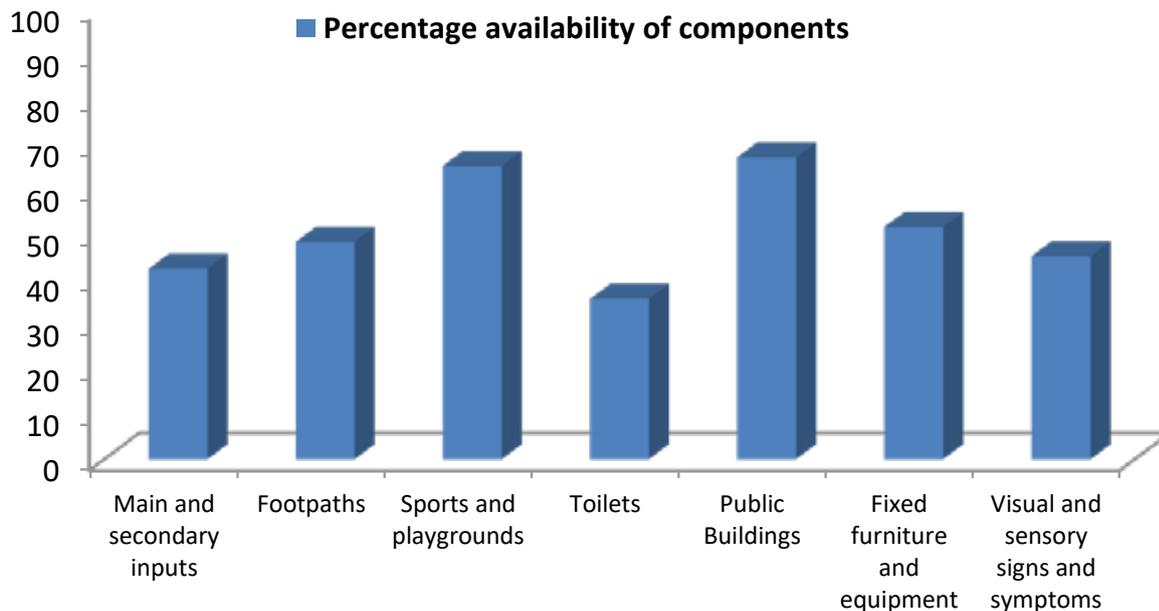


Fig.1. Percentage of accessibility of spaces and elements of parks. Source: Author.

Also, quantitative data and physical components extracted from the concepts of inclusive design and accessibility that were previously addressed and adjusted to document the current situation to assess the availability of parks.

To analyze the accessibility of parks, it is necessary to obtain a map of parks, but several factors such as the age of parks, lack of cooperation of green space experts in some municipal areas, case changes and construction operations in parks without a new map and impossibility of re-mapping due to Due to time constraints, it was not possible to access the latest map of some parks. Therefore, on a case-by-case basis, by applying changes and updating the existing situation on the old maps or aerial maps, the parks were evaluated.

Discussion

as shown in Table 7 , toilets have less accessibility than other components, followed by the main and secondary entrances. Traffic routes have minimal accessibility. Sports spaces and public buildings inside the parks are more accessible (in any case, the accessibility of any of the components is not more than 60%). Each of the components listed in Table 7 has its own set of criteria that,

after assessing the availability, can provide the following:

As shown in Fig. 2, most of the main and side entrances of the studied parks have a suitable width, but the difference in level, physical obstacles, and inappropriate and non-standard ramps make it inaccessible to people with physical disabilities.

As shown in Fig. 3, sidewalks in parks are usually of a good width, but due to physical obstacles in them, the difference in level, and the lack of suitable and standard ramps and the lack of a suitable and standard path for the blind (if limited and discontinuous), the inaccessibility of people with It has physical and sensory limitations .

As shown in Fig. 4,Adult sports areas in parks usually do not obstruct traffic and to some extent can be used by people with limited mobility, but people in wheelchairs could not use these devices. Also, children and adolescents play areas, although they have relatively good flooring, due to the difference in level compared to sidewalks and and the lack of play facilities for disabled and blind children. have limited accessibility

As shown in Fig. 5, toilets inside parks usually have a difference in level compared to sidewalks



Fig.2. Inaccessibility of Entrances. Daneshjoo Park (District 11). Photo: Neda Rafizadeh, 2016.



Fig.3. Inaccessibility of sidewalks Baharan Park (District 17). Photo: Neda Rafizadeh, 2016.



Fig. 4. Inaccessibility of play and sport spaces Fadak Park (district 8). Photo: Neda Rafizadeh, 2016.



Fig. 5. Inaccessibility of toilets. Almahdi Park (district 9). Photo: Neda Rafizadeh, 2016.

and if there is a ramp, it does not follow the existing standard. Also, the lack of a special toilet for the elderly and other people with limited mobility, makes it inaccessible.

As shown in Fig. 6, Most public buildings inside parks, such as restaurants, teahouses, prayer halls, libraries, park offices, etc., are not accessible to people with limited mobility. In most cases, they do not have suitable handrail

Conclusion

It is essential to pay attention to the accessibility



Fig.6. Inaccessibility of Public buildings. Piroozi Park (district 13) Photo: Neda Rafizadeh, 2016.

of the urban environment for people with physical and sensory limitations as one of the physical principles of inclusive design).

In this article, the availability of parks in Tehran was studied. For this purpose, first, by reviewing the theoretical and experimental literature, the indicators related to the comprehensive design were classified into physical and non-physical groups. Then, accessibility indicators were analyzed to assess the accessibility of park components such as entrances, sidewalks, public buildings, toilets, playgrounds, and sports resorts along with signs and symbols.

The results indicate that the main components of parks such as main entrances, access paths, toilets, and public buildings are not properly accessible for various reasons. Items such as unnecessary level differences at the entrance, inappropriate width of sidewalks, differences in the levels of sidewalks, and main spaces of parks that are related to the design stage. Improper execution of ramps, improper placement of fixed furniture in parks and improper location of play and sports spaces, which is partly related to the design and partly related to the execution stage. Also, ignoring the creation of unnecessary obstacles in the sidewalks and entrances of the parks, as well as changing the status of proper health services for people with disabilities, not repairing the worn floor covering and some cases that are related to the operation stage. [Table 8](#) shows the reasons for the unavailability of parks at different stages separately and briefly.

Therefore, the most important problem in most urban parks in terms of accessibility can be considered the following:

- Lack of sufficient technical knowledge of designers, supervisors of urban and development projects,
- Lack of attention to the rules, lack of awareness of the physical condition of people with disabilities, the elderly, the disabled, the blind and deaf, children and pregnant women and ...,
- Lack of coordination of different groups

of design, implementation and maintenance,
 - Inadequate management to maintain parks,
 Therefore, in order to increase the accessibility of parks and solve related problems, serious measures need to be taken.

Considering the issues regarding the reasons for the unavailability of parks, paying attention to the promotion of engineering knowledge through the necessary training and informing specialists and excellent supervision by experts at various levels of management, executive and planners, the existing challenges can be somewhat elevated.

In order to prioritize problem solving and adaptation of different components of the park, the following should be considered:

- Removal of fixed and mobile physical architectural and executive barriers while maintaining the continuity of the sidewalk in order to achieve the facilities and equipment available in the parks,
- Providing conditions for a person with limited mobility to use the facilities in the parks without the need for the help of others.

The use of physical and sensory signs and symptoms in parks should be such that people with visual and hearing impairments can easily navigate their route in order to use the facilities available in parks. One of these measures is the implementation of a special path for the blind in accordance with the rules in the main paths of the park.

- In order to make parks accessible, solving the problems of the current situation is an executive priority over creating new spaces without obstacles.

Technically, it is possible to propose solutions in each of the different parts of parks, including entrances, sidewalks, public buildings, especially health services, play and sports spaces, as well as equipment and furniture in accordance with the rules of urban planning and architecture for people. It has movement restrictions, as well as executive priorities for solving existing problems, which can be seen in [Table 9](#).

Table 8. Reasons for inaccessibility of urban parks. Source: Author.

Stages	Reasons for inaccessibility of urban parks	Feedback
Design stage	<ul style="list-style-type: none"> • Lack of sufficient technical knowledge • Lack of attention to comprehensive design and architectural and urban planning regulations related to people with mobility and sensory limitations • Topographic situation of the area and the existence of high longitudinal and transverse slopes and lack of skill of the designer in proper design in specific conditions of the place 	<ul style="list-style-type: none"> • Inaccessible design for people with reduced mobility • Using inappropriate and unnecessary surface differences in design <ul style="list-style-type: none"> • Lack of proper design of ramps in case of surface differences and longitudinal and transverse slopes of the ground and the use of unsuitable materials • Lack of proper design of toilets and not considering proper and accessible toilets for people with disabilities • Lack of special path design for the blind on footpaths • Lack of attention to the appropriate width of paths, openings and ... • Lack of anticipation of the auxiliary handrail on both sides of the ramps • Inadequate location for play ground and sports spaces resorts • Improper placement of fixed elements located in parks
Construction stage	<ul style="list-style-type: none"> • Lack of sufficient technical knowledge and awareness of contractors, supervisors and executors of construction projects of existing regulations. 	<ul style="list-style-type: none"> • Not paying attention to the continuous implementation of routes and not paying attention to removing unnecessary when building green spaces and sidewalks and sports spaces, etc. in parks • Lack of proper construction of toilets suitable for people with disabilities • Construction of fixed elements of parks in inappropriate places <ul style="list-style-type: none"> • Use of unsuitable materials as floor coverings • Inadequate lighting • Improper construction of ramps • Lack of attention to construction plans and details provided by the designer
Operation stage	<ul style="list-style-type: none"> • Creating barriers after construction due to the inability to maintain the safety of users and also the inability to confront motorcyclists • Lack of proper management of parks 	<ul style="list-style-type: none"> • Installation of chains, barriers and other construction barriers in front of park entrances or on the sidewalk • Converting a special toilet for the disabled into a warehouse or locking it • Failure to repair and replace damaged pavements or improper construction and create new barriers <ul style="list-style-type: none"> • Improper installation of signboards • No maintenance of garden lighting

Endnote

1. Proper size means that people who use assistive devices such as crutches, walkers, or wheelchairs can pass without colliding with others. This size is stated in the criteria between 120 and 150 cm.

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Table. 9. Proposed solutions to increase the accessibility of urban parks with an emphasis on inclusive design and prioritization of adaptation.
Source: Author.

Park components	Suggested solutions for accessibility	Prioritize, troubleshoot, and adaptation	
		1	2
Entrances	<ul style="list-style-type: none"> Remove existing physical barriers Use standard ramps (with a maximum slope of 8% and a length of 3 meters with a smooth and non-slip surface) with a suitable handrail bar according to the rules 	*	*
Sidewalks	<ul style="list-style-type: none"> Repairing and replacing unsuitable pavements. Removal of physical barriers and transfer of equipment outside the minimum crossing path to improve the width of the movement path (at least 90 cm) <ul style="list-style-type: none"> Creating a special path for the blind in the movement paths Remove the stairs or create a standard ramp next to it with a suitable handrail bar on both sides of the stairs and ramps. Destroying non-standard ramps and rebuilding them according to the rules and by creating a handrail bar on both sides 	*	*
Play and sport spaces	<ul style="list-style-type: none"> Remove all obstacles, differences in levels and stairs for access <ul style="list-style-type: none"> Floor improvement Remove worn-out play equipment and use standard and safe game and sport equipment <ul style="list-style-type: none"> Provide enough space around play and sports equipment to move safely Creating color contrast in equipment and play environment to maintain the safety of visually impaired people <ul style="list-style-type: none"> Predicting game and sport equipment for children with disabilities Provide a suitable and accessible bench around the children’s play area for parents with limited mobility to sit to monitor children 	*	*
Public buildings	<ul style="list-style-type: none"> Removal of all obstacles and surface differences at the main entrance and anticipation of standard ramps with suitable smooth and non-slip floor covering with suitable auxiliary handrail rod Create barrier-free space with dimensions of 150 × 150 cm in front of the entrance Modifying the interior of public buildings (coffee shop, library, ...) taking into account the characteristics of people with disabilities 	*	*
Toilets	<ul style="list-style-type: none"> Removing access barriers and level differences at the entrance and creating a standard ramp with handrails on both sides Creating a special toilet for the disabled and the accessibility of the interior of the building by making the necessary changes in the interior Construction of a new building if the necessary corrections in the existing situation are not possible 	*	*
Fixed furniture and equipment	<ul style="list-style-type: none"> Design, installation and placement of furniture and fixed equipment in parks (benches, drinking fountains and pavilions) according to the conditions of people with disabilities and children <ul style="list-style-type: none"> Design of drinking fountains in two different heights (80 and 110 cm) Predict the level path for access to drinking fountains and pavilions Predict barrier-free space in front of drinking fountains with dimensions of 150 × 150 cm 	*	*
Car parkings	<ul style="list-style-type: none"> Anticipation of parking for people with disabilities in the parking lot of the park If there is no public parking space, at least two special parking places should be considered along with the installation of signs and markings near the park and close to the main entrances (maximum 50 meters) on the side of the street. 	*	*
Visual and sensory signs	<ul style="list-style-type: none"> Use of necessary signs and symbols at an accessible height with appropriate color contrast and recognizable by the visually impaired and the elderly Use non-visual cues (olfactory, auditory, and tactile) to aid in navigation 	*	*

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