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Assessing building accessibility for university students with disabilities

Abstract

Accessibility for Person with a Disability (PWD) is a worldwide concern especially for academic facilities. Every PWD has right to full and equal enjoyment of the goods, services facilities, privileges, accommodations of any public accommodation. International standards should be followed in building new facilities whereas existing buildings can be modified to be accessible. Public accommodations are required to make their existing public areas accessible only if doing so is readily achievable. In other words, readily achievable barrier removal should be easily accomplished and could be carried out without much difficulty and effort or expense. Measuring accessibility in university buildings can help us identify accessibility problems and solutions in existing facilities. Currently, only a handful of research studies have focused on measuring accessibility in university buildings. Therefore, The Americans with Disabilities Act (ADA) Checklist for Readily Achievable Barrier Removal was used in this study to measure accessibility in university buildings. A convenient sample of 10 buildings within the University of Jordan was examined to investigate accessibility. Horizontal circulation, route of travel, and lavatories items were the most accessible items among university buildings. However, getting to the rest rooms, parking and drop-off, signage of goods and services items were the least accessible items. Collaborative professional teams need to work together to make universities buildings more accessible for persons with disabilities to meet their needs.

Keywords: accessibility, persons with disabilities, university students, academic institution

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Introduction

The University of Jordan is the first academic and research institution of Higher Education in Jordan. The university was established in 1962 and since then applied itself to the advancement of knowledge no less than to its dissemination. It is considered a comprehensive teaching, research and community-service institution which enables its students to choose from a wide range of programs. There are 18 faculties that offer more than 3500 different courses, for about 43.794 students and 255 students with disability.[1] Data indicate that the number of students with disabling conditions in postsecondary institutions is increasing. The efforts made by universities were examined to ensure that special needs students are able to access higher education programs.[2] In addition, the institution and course choice of some students was affected by physical access issues.[3] They define disabled people as "persons with physical, mental and intellectual disabilities that hindered them from fully participating in a normal way in the community way of life."[4] The aim of rehabilitation is for the patients to return to the environment and his/her lifestyle. It also aims to encourage the patients to achieve satisfaction in productive activity and personal independency, by engaging in social and functional interaction with other people and his/her environment.[5] Therapists strive to foster independence in all aspects of daily life. This includes not only activities of daily living, but also includes encouraging patient re-integration into the community. "Most of these needs are presented under the umbrella term 'access'.[6] Restriction of mobility is likely to be the most common handicap amongst persons with disabilities.[7] Accessibility built environment is one of the primary concerns of urban planning and design. An urban space can be a successful public place if accessibility is provided. Besides this, a public place should provide accessibility to everyone, regardless physical abilities or financial resources, because 'accessibility is the freedom and the ease of individuals to decide to participate in different activities'.[5] Assessment of building accessibility and public accommodations is the first step in a planning process for readily achievable barrier removal. This assessment is usually done manually which is a source of errors that may affect the reliability of the evaluation results.[8] However, assessments could be done through using some objective outcome measures and checklists that are valid and reliable. These checklists will help us to identify accessibility problems and solutions in existing facilities in order to meet obligations and accessibility universal standards.[9] The goal of such checklists is to study how to make the facilities accessible for persons with disabilities. The Americans with Disabilities Act (ADA) Checklist for Readily Achievable Barrier Removal "Checklist for Existing Facilities-Version 2.1" highlights some of the requirements found in the ADA Standards for buildings accessibility.[10] Few studies have been identified that examined the degree of accessibility at universities in both eastern and western world. Furthermore, there is no descriptive research that studies the accessibility for the University of Jordan or any other university in Jordan. Therefore, the purpose of this study was to examine the degree of accessibility for University of Jordan facilities and buildings for persons and students with disabilities.

Methods

A team consisted of undergraduate research assistants and occupational therapy students conducted this study. The Americans with Disabilities Act (ADA) Checklist for Readily Achievable Barrier

Removal "Checklist for Existing Facilities-Version 2.1" was used to measure accessibility in university buildings. The accessibility of a total of ten buildings out of twenty-eight within the University of Jordan (U of J) was investigated. Our sample included 10 on-campus buildings established between the year of (1962) and the year of (1999). All selected buildings had only one construction and were either academic or non-academic buildings that serve not only students but also other on-campus and off-campus community populations such as faculty members, employees, family members, and other visitors. Buildings that had more than one construction were excluded because of time limitation. In addition, buildings that yielded missing data due to many non-applicable items in the ADA checklist were also excluded. This study was conducted using the standards derived from the ADA checklist. This checklist is based on four priorities recommended by the Title III regulations for planning readily achievable barrier removal projects:

a. Accessible approach and entrance Priority
b. Access to goods and services Priority
c. Access to rest rooms Priority
d. Any other measures necessary

Priority number 4 (any other measures necessary) and some subtitles were removed because most items in this priority were not applicable to the buildings examined (e.g., drinking fountains, public telephones).

The ADA checklist was used to record the data from direct observation and measurement. Priority 1 focuses on those persons with disabilities should be able to arrive on the site, approach the building, and enter as freely as everyone else. At least one route of travel should be safe and accessible for everyone, including persons with disabilities. Priority 2 focuses on that the layout of the building should allow persons with disabilities to obtain materials or services without assistance. Priority 3 focuses on that when rest rooms are open to the public, they should be accessible to persons with disabilities.

Results

Descriptive statistics of simple percentages and means were used to determine the level of accessibility to the surveyed buildings based on the guidelines and standards of the ADA checklist. The scores indicate the number of accessible buildings.

Accessible approach/entrance

Four subtitles were surveyed to assess accessible approach/entrance:

Route of travel

Five items were surveyed to assess route of travel. All items were applicable to assess for all buildings (n=10). The mean compliance percentage recorded in route of travel was 86% (Table 1).

Table 1 Compliance Score of Accessible Approach/Entrance

Items	Score	%	Number of buildings (n=10)
1. Accessible Approach/Entrance			
1.1. Route of Travel			
Is there a route of travel that does not require the use of stairs?	10	100%	10
Is the route of travel stable, firm and slip-resistant?	10	100%	10
Is the route at least 36 inches wide?	10	100%	10
Can all objects protruding into the circulation paths be detected by a person with a visual disability using a cane?	6	60%	10
Do curbs on the route have curb cuts at drives, parking, and drop-offs?	7	70%	10
Total	43	430%	
Mean	8.6	86%	
1.2. Ramps			
Are the slopes of ramps no greater than 1:12?	7	70%	10
Do all ramps longer than 6 feet have railings on both sides?	5	71.40%	7
Is the width between railings or curbs at least 36 inches?	7	100%	7
Are ramps non-slip?	10	100%	10
Total	29	341%	
Mean	7.25	85%	
1.3. Parking and Drop-Off Areas			
Are an adequate number of accessible parking spaces available?	7	77.80%	9

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Table Continued

Items	Score	%	Number of buildings (n=10)
Are the access aisles part of the accessible route to the accessible entrance?	6	60%	10
Are the accessible spaces closest to the accessible entrance?	4	40%	10
Is there an enforcement procedure to ensure that accessible parking is used only by those who need it?	2	20%	10
Total	19	197.80%	
Mean	4.75	49.45%	
1.4. Entrance			
If there are stairs at the main entrance, is there also a ramp or lift, or is there an alternative accessible entrance?	7	70%	10
Do all inaccessible entrances have signs indicating the location of the nearest accessible entrance?	1	10%	10
Can the alternate accessible entrance be used independently?	6	66.70%	9
Does the entrance door have at least 32 inches clear opening (for a double door, at least one 32-inch leaf)?	8	80%	10
Is there at least 18 inches of clear wall space on the pull side of the door, next to the handle?	8	80%	10
Is the door handle no higher than 48 inches and operable with a closed fist?	9	100%	9
Can doors be opened without too much force exterior doors reserved; maximum is 5 lb for interior doors)?	5	50%	10
Total	44	457%	
Mean	6.3	65%	

Ramps

Four items were surveyed to assess ramps. Items "Do all ramps longer than 6 feet have railings on both sides?", and "Is the width between railings or curbs at least 36 inches?" were applicable to assess for seven buildings (n=7), however; the other two items were applicable to assess for all buildings (n=10). The mean compliance percentage recorded of ramps was 85% (Table 1).

Parking and drop-off areas

Four items were surveyed to assess parking and drop-off areas. Item "Are an adequate number of accessible parking spaces available?" was applicable to assess for nine buildings (n=9). However, the other three items were applicable to assess for all buildings (n=10). The mean compliance percentage recorded of parking and drop-off areas was 49.45% (Table 1).

Entrance

Seven items were surveyed to assess the entrance. Items "Can the alternate accessible entrance be used independently?", and "Is the door handle no higher than 48 inches and operable with a closed fist?" were applicable to assess for nine buildings (n=9). However, the other five items were applicable to assess for all buildings (n=10). The mean compliance percentage recorded of entrance was 65% (Table 1).

Maximum obtainable score on each item is 10, representing 100%

Access to goods and services

Eight subtitles were surveyed to assess access to goods and services:

Horizontal circulation

Four items were surveyed to assess horizontal circulation. All items were applicable to assess for all buildings (n=10) except the last item "Is there a 5-foot circle or a T-shaped space for a person using a wheelchair to reverse direction?" (n=8). The mean compliance percentage recorded in horizontal circulation was 94% (Table 2).

Doors

Four items were surveyed to assess the doors. All items were applicable to assess for all buildings (n=10). The mean compliance recorded in doors was 83% (Table 2).

Rooms and spaces

Three items were surveyed to assess rooms and spaces. The first two items were applicable to assess for all buildings (n =10); however, the third item "In circulation paths through public areas, are all obstacles cane-detectable (located within 27 inches of the floor or higher than 80 inches, or protruding less than 4 inches from the wall)?" was applicable to assess seven buildings (n=7). The mean compliance recorded in rooms and spaces was 68% (Table 2).

Signage for goods and services

Six items were surveyed to assess signage for goods and services. All items were applicable to assess for all buildings (n=10). The mean compliance recorded in signage for goods and services was 55% (Table 2).

Controls

Two items were surveyed to assess controls. Item "Are they operable with a closed fist?" was applicable to assess eight buildings

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(n=8); however, item "Are all controls that are available for use by the public (including electrical, mechanical, cabinet, game, and self-service controls) located at an accessible height?" was applicable to assess all buildings (n=10). The mean compliance recorded in controls was 79% (Table 2).

Vertical circulation

Two items were surveyed to assess vertical circulation. The two items were applicable to assess all buildings (n=10). The mean compliance percentage recorded in vertical circulation was 80% (Table 2).

Stairs

Two items were surveyed to assess stairs. The two items were applicable for all buildings (n=10). The mean compliance percentage recorded in stairs was 60% (Table 2).

Elevators

Six items were surveyed to assess elevators. The first five items were applicable to assess nine buildings (n=9). However, item "is the emergency intercom identified by braille and raised letters?" was applicable to assess eight buildings (n=8). The mean compliance percentage recorded in elevators was 62.30% (Table 2).

Maximum obtainable score on each item is 10, representing 100%

Table 2 Compliance Score of the Access to Goods and Services

Items	Score	%	Number of buildings (n=10)
1. Access to Goods and Services			
1.1. Horizontal Circulation			
Does the accessible entrance provide direct access to the main floor, lobby, or elevator?	10	100%	10
Are all public spaces on an accessible route of travel?	9	90%	10
Is the accessible route to all public spaces at least 36 inches wide?	10	100%	10
Is there a 5-foot circle or a T-shaped space for a person using a wheelchair to reverse direction?	7	87.50%	8
Total	36	378%	
Mean	9	94%	
1.2. Doors			
Do doors into public spaces have at least a 32-inch clear opening?	8	80%	10
On the pull side of doors, next to the handle, is there at least 18 inches of clear wall space so that a person using a wheelchair or crutches can get near to open the door?	8	80%	10
Can doors be opened without too much force (5 lbf maximum for interior doors)?	7	70%	10
Are door handles 48 inches high or less and operable with a closed fist?	10	100%	10
Total	33	330%	
Mean	8.25	83%	
1.3. Rooms and Spaces			
Are all aisles and pathways to materials and services at least 36 inches wide?	10	100%	10
Is there a 5-foot circle or T-shaped space for turning a wheelchair completely?	9	90%	10
In circulation paths through public areas, are all obstacles cane-detectable (located within 27 inches of the floor or higher than 80 inches, or protruding less than 4 inches from the wall)?	1	14.28%	7
Total	20	204%	
Mean	6.67	68%	
1.4. Signage for Goods and Services			

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Items	Score	%	Number of buildings (n=10)
If provided, do signs and room numbers designating permanent rooms and spaces where goods and services are provided comply with the appropriate requirements for such signage?	10	100%	10
• Signs mounted with centerline 60 inches from floor.	4	40%	10
•Mounted on wall adjacent to latch side of door, or as close as possible.	9	90%	10
• Raised characters, sized between 5/8 and 2 inches high, with high contrast (for room numbers, rest rooms, and exits).	10	100%	10
• Brailed/ text of the same information.	0	0%	10
If pictogram is used, it must be accompanied by raised characters and braille.	0	0%	10
Total	33	330%	
Mean	5.5	55%	
1.5. Controls			
Are all controls that are available for use by the public (including electrical, mechanical, cabinet, game, and self-service controls) located at an accessible height?	7	70%	10
Are they operable with a closed fist?	6	87.50%	8
Total	13	158%	
Mean	6.5	79%	
1.6. Vertical Circulation			
Are there ramps, lifts, or elevators to all public levels?	8	80%	10
On each level, if there are stairs between the entrance and/or elevator and essential public areas, is there an accessible alternate route?	8	80%	10
Total	16	160%	
Mean	8	80%	
1.7. Stairs			
Do treads have a non-slip surface?	8	80%	10
Do stairs have continuous rails on both sides, with extensions beyond the top and bottom stairs?	4	40%	10
Total	12	120%	
Mean	6	60%	
1.8. Elevators			
Are there both visible and verbal or audible door opening/closing and floor indicators (one tone = up, two tones = down)?	4	44.50%	9
Are the call buttons in the hallway no higher than 42 inches?	6	66.70%	9
Do the controls inside the cab have raised and braille lettering?	6	66.70%	9
Is there a sign on both door jambs at every floor identifying the floor in raised and braille letters?	5	55.60%	9
If an emergency intercom is provided, is it usable without voice communication?	7	77.80%	9
Is the emergency intercom identified by braille and raised letters?	5	62.50%	8
Total	33	373.80%	
Mean	5.5	62.30%	

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Usability of rest rooms

Three subtitles were surveyed to assess usability of rest rooms:

Getting to the rest rooms

Two items were surveyed to assess getting to the rest rooms. Item "If rest rooms are available to the public, is at least one rest room (either one for each sex, or unisex) fully accessible?" was applicable to assess eight buildings (n=8). However, item "Are there signs at inaccessible rest rooms that give directions to accessible ones?" was applicable for seven buildings (n=7). The mean compliance percentage recorded in getting to the rest rooms was 45.54% (Table 3).

Doorways and passages

Seven items were surveyed to assess doorways and passages. All the items were applicable to assess eight buildings (n=8) except for the first item "Is there tactile signage identifying rest rooms?" which was applicable to assess nine buildings (n=9). The mean compliance percentage recorded in doorways and passages was 72.43% (Table 3).

Lavatories

Five items were surveyed to assess lavatories. All items were applicable to assess for all buildings (n=10) except for the item "Can the faucet be operated with one closed fist?" which was applicable for nine buildings (n=9). The mean compliance percentage recorded in lavatories was 84% (Table 3).

Table 3 Compliance Score of the Usability of Rest Rooms

Items	Score	%	Number of buildings (n=10)
1. Usability of Rest Rooms			
1.1. Getting to the Rest Rooms			
If rest rooms are available to the public, is at least one rest room (either one for each sex, or unisex) fully accessible?	5	62.50%	8
Are there signs at inaccessible rest rooms that give directions to accessible ones?	2	28.57%	7
Total	7	91.07%	
Mean	3.5	45.54%	
1.2. Doorways and Passages			
Is there tactile signage identifying rest rooms?	4	44.50%	9
Are pictograms or symbols used to identify rest rooms, and, if used, are raised characters and braille included below them?	2	25%	8
Is the doorway at least 32 inches clear?	8	100%	8
Are doors equipped with accessible handles (operable with a closed fist), 48 inches high or less?	8	100%	8
Can doors be opened easily (5 lbf maximum force)?	7	87.50%	8
Does the entry configuration provide adequate maneuvering space for a person using a wheelchair?	6	75%	8
Is there a 36-inch-wide path to all fixtures?	6	75%	8
Total	41	507.00%	
Mean	5.86	72.43%	
1.3. Lavatories			
Does one lavatory have a 30-inch-wide by 48-inch-deep clear space in front?	10	100%	10
Is the lavatory rim no higher than 34 inches?	10	100%	10
Is there at least 29 inches from the floor to the bottom of the lavatory apron (excluding pipes)?	7	70%	10
Can the faucet be operated with one closed fist?	8	88.90%	9
Is the mirror mounted with the bottom edge of the reflecting surface 40 inches high or lower?	6	60%	10
Total	41	419%	
Mean	8.2	84%	

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Discussion

In this study a convenience sample of 10 buildings out of 28 within the University of Jordan was examined to investigate accessibility. High percentages indicated relatively high compliance and good accessibility while low percentages indicated relatively low compliance and poor accessibility. In the accessible approach and entrance, the highest compliance percentage was in the route of travel section (86%). Most routes did not require the use of stairs, were stable, firm and slip-resistant, and were at least 36 inches wide. The lowest compliance percentage was in the parking and drop-off section (49.45%). Some of them did not have an enforcement procedure to ensure that accessible parking is used only by those who need it, and the accessible spaces were not closest to the accessible entrance. In the access to goods and services, the highest compliance percentage was in the horizontal circulation (94%). Most of their entrance provided direct access to the main floor, lobby, or elevator, and the accessible route to all public spaces was at least 36 inches wide. The lowest compliance percentage was in the signage of goods and services (55%). None of the buildings had raised characters and Braille texts of the pictogram. In the access to rest rooms, the highest compliance percentage was in the lavatories (84%). Most of the buildings had at least one accessible lavatory that had 30 inches wide by 48 inches deep clear space in front, and the lavatory rim was no higher than 34 inches. The lowest compliance percentage was in getting to the rest rooms (45.54%). Most of them did not have at least one rest room fully accessible, and there were no signs at inaccessible rest rooms that give directions to accessible ones.

This study helped us to identify accessibility problems and some possible solutions in the existing buildings at the University of Jordan in order to meet obligations and accessibility universal standards. Some possible solutions for Route of travel are to: widen route, move or remove protruding objects, and add a ramp if the route of travel is interrupted by stairs. Some possible solutions for Ramps are to: lengthen ramp to decrease slope, add railings, widen the ramp, and add non-slip surface material. Some possible solutions for Entrance are to: install signs, replace inaccessible knobs with a lever or loop handle, and adjust door closers. Some possible solutions for stairs are to: add non-slip surface to treads, and add or replace handrails if possible within existing floor plan. Some possible solutions for Elevators are to: provide a permanently attached reach stick, and install raised lettering and braille next to buttons. This study had some limitations. A convenience sample with a relatively small sample size was used in this study. Our study only included buildings in one university in Jordan. There were also time limitations for conducting the study due to other workload demands as well as the bad weather conditions which limited the data collection process. In addition, our study didn't include all items from the ADA checklist because there were many non- applicable items on most of the studied buildings, such as drinking fountains and public telephones. For future studies, we recommend to use a larger sample through the inclusion of more universities and buildings that are applicable to most of the items on the ADA checklist whenever possible. The more items we include the more informative data we can obtain. Expanding the timeline to conduct the study and having multiple visits to the different sites and under-investigation buildings to eliminate the effect of missing data and bad weather conditions as much as possible are also recommended. Additionally, we recommend conducting qualitative research studies that would include the very valuable points of view and inputs of persons with disabilities which make the results of the study more useful.

Conclusion

This study has provided useful baseline data for future studies in the University of Jordan buildings and in other universities in Jordan in general which are used for educational and community services and need to be accessible. The compliance scores for some items such as Getting to the Rest Rooms, Parking and Drop-off Areas, Signage for Goods and Services, Stairs, Elevators, and Entrance for persons with disabilities (student, worker or visitors) in the University of Jordan had the lowest scores among other scores, which means the least accessible items among buildings. This is probably because the physically challenged persons and experts in the area of physical ability management were not consulted and involved in the design and construction of these buildings. To improve accessibility in the University of Jordan buildings, there should be synchronization among the users of these areas, the occupational therapists, physiotherapists, politicians, engineers and architects. Collaborative professional teams need to work together to make universities buildings even more accessible for every person with disability to meet the needs for this vulnerable population in our community.

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Conflict of interests

Author declares that there is no conflict of interest.

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