

**ANALYZING LIVING SPACE AND PRODUCT DESIGN IN THE CONTEXT OF  
UNIVERSAL DESIGN PRINCIPLES: INSTITUTIONAL ELDERLY HOUSING****Bülent ÜNAL / Assistant Professor**

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**Abstract**

With the increase in life expectancy and population aging, elderly prefer to spend time with their peers and live in housings that contribute to successful aging. Thus, elders need spaces contributing to their daily activity patterns. This study focuses on living spaces and the products within the living space in an institutional elderly housing located in Ankara, Turkey. A qualitative field study was conducted in which the living spaces and products within the living space that the elderly used, were analyzed and evaluated with respect to the universal design principles. Within the scope of the universal design principles, the living space and the products that are utilized in the space have both positive and negative evaluations. These evaluations are presented in detail and supported by photographs. In line with the function, the design of the spaces and products for the elderly should be planned by considering the anthropometric features and the activities of daily living of the elderly. Current study shows the necessity to pay attention and to use the principles as a guideline in both interior design and product design.

**Keywords:** Universal design, Product design, Living space, Elderly; Disability, Institutional elderly housing

**YAŞAM ALANI VE ÜRÜN TASARIMININ EVRENSEL TASARIM PRENSİPLERİ  
BAĞLAMINDA ANALİZİ: HUZUREVİNDE BİR VAKA ÇALIŞMASI****Özet**

Yaşam beklentisinin artması ve nüfusun yaş ortalamasının artması ile yaşlılar yaşlılarıyla vakit geçirmeyi ve sağlıklı yaşlanmaya katkı sağlayan konutlarda yaşamayı tercih etmektedirler. Bu nedenle, yaşlıların günlük aktivite düzenlerine katkıda bulunan alanların ve ürünlerin tasarımlarının ihtiyaçlarına cevap verebilecek nitelikte olması ve evrensel tasarım prensipleri doğrultusunda tasarlanması kritik önem taşımaktadır. Bu çalışma, Ankara'da bulunan kurumsal bir yaşlı konutundaki yaşam alanlarına ve yaşam alanındaki ürünlere odaklanmaktadır. Yaşlıların kullandığı yaşam alanı içerisindeki alanların ve bu alanda kullanılan endüstriyel ürünlerin evrensel tasarım ilkelerine göre analiz edildiği ve değerlendirildiği nitel bir saha çalışması yapılmıştır. Evrensel tasarım ilkeleri kapsamında mekanda kullanılan yaşam alanı ve ürünlerin olumlu ve olumsuz değerlendirmeleri bulunmaktadır. Bu değerlendirmeler detaylı bir şekilde sunulmakta ve fotoğraflarla desteklenmektedir. İşleve uygun olarak yaşlılara yönelik mekan ve ürünlerin tasarımı, yaşlıların antropometrik özellikleri ve günlük yaşam aktiviteleri dikkate alınarak planlanmalıdır. Mevcut çalışma, hem mekan tasarımında hem de ürün tasarımında dikkat edilmesi ve ilkelerin bir kılavuz olarak kullanılması gerektiğini göstermektedir.

**Anahtar Sözcükler:** Evrensel tasarım, Ürün tasarımı, Yaşam alanı, Yaşlılar, Engellilik; Huzurevi

## INTRODUCTION

The increase in life expectancy and population aging are widely recognized worldwide phenomena (Demirkan, 2007; Iancu - Iancu 2020; United Nations, 2020). Population aging, which is characterized by an increasing number of people who are aged 60 years or older, has become one of the most significant social transformations (Junior, et al. 2018; United Nations, 2020). According to UN projections (2020), by 2050 every sixth person in the world will be aged 65 or older and exceed the number of adolescents and youth aged 15 to 24 years. In Turkey, it is predicted that 10.2% of the population will be over the age of 65 in the year 2025, and 16.3% in 2040 (Turkish Statistical Institute, 2018). These estimates show that there will be rising demand for healthcare, assistive living and independent living for elderly and designers should be concerned about the quality of life of elderly (Demirbilek - Demirkan 1998; Demirbilek - Demirkan 2004; Demirkan, 2007; Fang, et al. 2014; Iancu - Iancu 2020). In many countries, people who are over 65 are at or approaching 15% of the population (Crews - Zavotka 2006). Since the numbers have increased, health care expenses have increased with extensive research on the health, wellbeing, and the life expectancy of the elders have increased. Nowadays, this age group is further categorized as: “the young-old ages 65–74, the old-old ages 75–84, and the oldest-old ages 85+” (Crews - Zavotka 2006: 113). Disability increases with increasing age among these elders. For example, at ages 65-69 years the inability to complete one activity of daily living increased from 5-7% about 28–36% at ages 85 and above in 1987 (Crews - Zavotka 2006).

It is widely recognized that there are less opportunities and a poorer standard of life for people with disabilities than those without disabilities. There are many definitions of disability. With the declaration (ICF- International Classification of Impairments, Disabilities and Handicaps) published by the World Health Organization (WHO) in 1980, three different categories of disability were defined:

- a. Impairment: It refers to the loss of the physiological, psychological or anatomical structure or its abnormality for any reason. This definition expresses deterioration and setbacks especially at the organ level.
- b. Disability: It reflects the decrease in the functional performance and activities of the individual. Disability represents person-level disorders.
- c. Handicap: It is the inability of a person to fulfill the life requirements that are accepted as normal for their age, gender, social and cultural level due to the above-mentioned disability or disability (ICF, 2001).

The physical environment in which impaired, disabled or handicapped people live is of great importance due to their physical dysfunction / inadequacy and the limitations caused by this. Every person, regardless of age and ability has the right to live by the same standards. Treffers (2004: 3) stated that “designing places and spaces for all means designing society, including aging people”. Consequently, the design of the built environment can impact the participation and engagement of the elderly both positively and negatively (Demirkan, 2007; Liu - Lapane 2009; Verbrugge - Jette 1994). Due to the impact the built environment has on daily functioning in elderly, designers must consider changes encountered during the aging process (Demirbilek - Demirkan 1998; Demirbilek - Demirkan 2004). Designers should accept that being an elder does not mean that the individual’s characteristics will remain the same throughout his/her lifetime. As a result, designers need to acknowledge, understand and care

for the variety of abilities and requirements of the elderly (Afacan, 2016; Altay, 2017). The elderly should be accepted as the determining factor in design and be accepted as a base and reference to the human interaction with the built environment and products. At all stages of the design process especially before the introduction of new products, designers should make evaluative research with respective groups of elderly users (Demirbilek - Demirkan 2004; Sandhu, 1993). Thoughtfully designed environments and products that consider the basic needs of the elderly, help to accommodate varying activities, reduce disabilities and provide engagement in everyday activities (Liu - Lapane 2009; Verbrugge - Jette 1994). Thus, universally designed environments and products create opportunities for the elderly to participate in these activities and provide accessible and accommodating environments and products without stigmatization.

With the disability right movement, societies have moved in a direction that has broad implications for everyone, not only for people with disabilities. This movement has led to the development of the concept of universal design (UD) (Steinfeld - Maisel 2012). Steinfeld and Maisel (2012:29) proposed UD as “a process that enables and empowers a diverse population by improving human performance, health and wellness, and social participation”. UD, which is a philosophical approach, is defined as “the design of products and environments to be usable by all people to the greatest extent possible without the need for adaptation or specialized design” (The Center for Universal Design, 1997: para.1). UD is characterized by the seven principles that are equitable use, flexibility in use, perceptible information, simple and intuitive use, low physical effort, tolerance for error, size and space for approach and use (see Table 1). The “application of the universal design principles highlights that universal design requires integration of accessibility and usability features from the onset, removing any stigma and resulting in social inclusion of the broadest diversity of users” (Iwarsson - Stahl 2003: 61). In other words, ensuring accessibility without stigmatization by incorporating accessibility features that will support all users is the main principle of universal design (Story, 1998). These principles can be applied to all disciplines of design, such as those that focus on built environments, products, and communications.

**Table 1. The Principles of UD (The Center for Universal Design, 1997)**

Principles	Description
1. Equitable use	The design is useful and marketable to people with diverse abilities.
2. Flexibility in use	The design accommodates a wide range of individual preferences and abilities.
3. Simple and intuitive use	Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.
4. Perceptible Information	The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.
5. Tolerance for Error	The design minimizes hazards and the adverse consequences of accidental or unintended actions.
6. Low Physical Effort	The design can be used efficiently and comfortably and with a minimum of fatigue.
7. Size and Space for Approach and Use	Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture, or mobility.

UD is often used interchangeably with the terms inclusive design and design for all. These concepts focus on the principle of inclusion of all, acknowledging diversity and equality and provide a means for understanding accessibility within user groups, in other words, they intend to reflect a design philosophy that recognizes, respects, and attempts to accommodate the broadest range of human abilities, requirements and preferences in the design of environments and products (Altay - Demirkan 2014; Bühler - Stephanidis 2004; Darzentas - Miesenberger 2005).

Designers are considered to be advocates for UD. They need to ensure the built environment is designed inclusively to meet the requirements of the diverse population and enhance social equality (Mulligan, et al. 2018; Calder, et al. 2018). Major attempts have also been made within product design to establish specific guidelines for UD. In designing a product, it is significant to minimize the exclusion that requires knowledge of the demands made by a product “on its users’ sensory, cognitive and motor capabilities, and knowledge of the range of these capabilities within the user population” (Clarkson, 2008: 166). Users will avoid using the product or experience trouble if their capabilities do not fulfil the demand of the product. As a result, understanding the characteristics and capabilities of the target users of a new product is necessary for a ‘good’ design. For example, Panasonic, proposed the following guidelines: “1) easy-to-understand operation, 2) space to support easy access, 3) uncomplicated displays and indicators 4) peace of mind and security, 5) natural posture and ease of movement, and 6) consideration of how product is used and maintained” (Panasonic, 2010 cited in McAdams and Kostovich, 2011: 32). Likewise, a well-designed product, which is appropriate for use by all and in accordance with the universal design principles (UDPs), should enable equal use and offer flexibility, simplicity, comprehensibility, perceptibility, minimization of danger, comfort and accessibility in accordance with personal preference and abilities (Demirbilek - Demirkan 2004; Müezzinoğlu - Hidayetoğlu 2019).

Equitable access and the freedom to interact with the environment and products without limitations or discrimination is a basic human necessity (Calder, et al. 2018). With respect to the elderly, performing activities of daily living (ADL) are considered as the basic content of successful and healthy life. Consequently, it is important to have equitable access without restrictions in ADL (Calder, et al. 2018; Demirkan - Olguntürk 2014; Horgas, et al. 1998; Mahoney - Barthel 1965; Taşoz - Afacan 2020). ‘Basic activities of daily living’ (BADL) and ‘instrumental activities of daily living’ (IADL) are related to the independence of elderly and are pertinent to the built environment and products. BADL consists of daily self-care tasks related to survival such as eating, bathing and functional mobility, whereas IADL involves tasks for supporting life in the society (Dias, et al. 2019). The implementation of the UDPs to the ADLs would provide an opportunity to the older adults to easily accomplish BADLs and IADLs. Table 2 provides examples of some universal design techniques that will allow older adults to accomplish ADLs (Carr, et al. 2013).

**Table 2. Examples of Some UD Techniques That Will Allow Older Adults to Accomplish ADLS (adapted from Carr, et al. 2013).**

Activities of daily living	Examples of UD
Bathing	Make provisions during construction to reinforce walls in the shower area to facilitate future installation of grab bars, Bathtub/shower controls positioned to allow for operation outside the fixture, Lever handle faucets, No threshold walk-in shower
Physical ambulation	No threshold, zero step entrances, Wider doorways and corridors, Open floor plan, Straight staircases with consistent risers and treads and a landing between levels
Toileting	Make provisions during construction to reinforce bathroom walls to facilitate future installation of grab bars by the toilet, Adjustable toilet and sink for easy access, with a short reaching distance to paper dispenser and grab bars
Food preparation	Kitchen counter tops at varying levels to accommodate standing and seated users, and people of varying heights, Kitchen cabinets that accommodate limited reach ranges and allow various ways for approach and manipulation, Color contrasts, large-print readouts, audible and tactile feedback of controls

Nowadays with the increase in the older population and changes in family lifestyles, elderly tend to spend time socializing with their peers rather than with their younger family members (Glass - Plaats 2013). Especially in old age, housing gains importance. Housing must meet the needs of the elderly for their everyday activities and provide them satisfaction, security, comfort and independence (Demirbilek Demirkan 1998). In addition, housing should be designed in accordance with the universal design principles and accommodate people with diverse capabilities and needs. Such housing contributes to successful aging where successful aging is defined as “maintaining a high level of physical and cognitive functioning, avoiding disease, and active engagement in life” (Rowles, 2018: 83; Carr, et al. 2013). Depending on the engagement profiles of the elderly various housing environments exist, such as individual or family housing, assisted living, elderly cohousing communities and institutional elderly housing (Rowles, 2018). Institutional elderly housing consists of nursing homes that are founded for elderly who are either functionally independent or partially independent but require physiological support, medical support or social support in ADL (Rowles, 2018). The design of these environments and the products within the building should comply with the universal design principles and fulfill the needs of the elderly.

### AIM OF THE STUDY

The application of the UDPs highlight accessibility and usability of spaces and products by a diverse group of users. Especially the inclusion of elderly in daily life and supporting their activities of daily living at normal standards without excluding them from other individuals is crucial. The aim of the study is to analyze and evaluate the living spaces in an institutional elderly housing and the products within the space with respect to the UD principles. The focus is on the interior space where the elderly live and how the products within the space respond to the usage of the elderly.

### METHOD OF THE STUDY

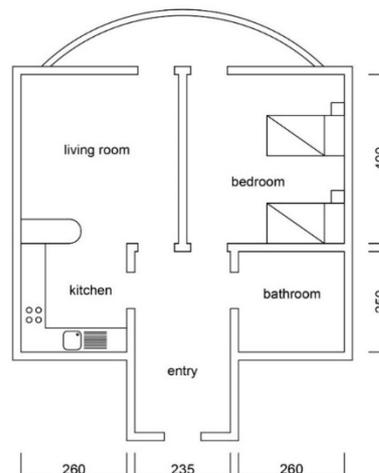
In order to analyze the living spaces and products within the living spaces, this study has been formulated as a qualitative field study in an institutional elderly housing located in Ankara, Turkey. The research data are obtained by the researcher by analyzing and evaluating living spaces in the pre-determined institutional elderly housing according to the UDPs. The analyzes are supported by photographs taken within the research site and elaborated in the findings section.

#### Description Of The Site

The institutional elderly housing, which was opened in 2001, consists of 294 beds for the elderly. The institution is composed of 7 blocks (A – G Blocks) that has social, sportive, and healthcare facilities, living spaces and administrative units. There are 3 different types of living units. The elderly can either stay alone in the single rooms that are 27m<sup>2</sup> (see Fig.1), or stay with another elderly person in the 2-bedded rooms that are 34m<sup>2</sup>, or they can stay in the studio-type living units that consist of a separate bedroom and a living area, which are 55m<sup>2</sup> (see Fig. 2). The layout of the 2-bedded room is similar to the single room in which there is an additional bed. In the institution, there are five 2-bedded rooms, 40 studio-type living units and the rest are single rooms. Every living unit consists of a refrigerator, extractor fan in the cooking area, electrical cooking appliances in the kitchenette, a special designed bed, bedside table, armchairs, table, ottoman, chest of drawers that can be also used as a TV stand, and a wardrobe. The single room living unit within the selected institution has been included in the study. The interior space and products that constitute the space are evaluated according to the UDPs by the researcher.



Figure 1. Single Room Plan



**Figure 2. Studio-Type Living Unit Plan**

## FINDINGS

The interior space and the products in the single room living unit was evaluated according to the UDPs by indicating its positive and negative aspects, respectively.

According to Principle 1: Equitable Use, “the design should provide the same means of use for all users; avoid segregating or stigmatizing any users; provide privacy, security, and safety equally available to all users; and make the design appealing to all users” (The Center for Universal Design, 1997).

- In the living spaces of the elderly, it is necessary to avoid step and elevation differences as much as possible. Thus, the natural walking rhythm of the elderly is not disturbed and the risk of an accident is reduced. There are no level differences within the living spaces (see Table 3, Fig. 3). With this, the elderly who experience difficulty in walking and use support elements such as canes and wheelchairs are not segregated from other individuals. This means that it provides equal usage for all users. Additionally, a height difference and a feature such as a step in the transition area can cause the elderly to get stuck while walking or even cause them to fall. Safety is provided by not creating a level difference.

- In the kitchenette, task lighting is located between the counter and cabinet (see Table 3, Fig. 4). Kitchens are one of the places where household accidents occur frequently. In particular, not providing sufficient amount of natural or artificial light on the working surface in the kitchen can create a danger for the elderly who have limited vision ability when using dangerous materials such as knives.

- There should be a bedside table where the elderly can put things that they will need frequently such as phones, glasses and medicines. The bedside table makes their needs accessible. In addition, switches and electrical outlets are accessible (see Table 3, Fig. 5).

- In the bathroom, there are grab bars (see Table 3, Fig. 6). Bathrooms, like kitchens, are the other places where household accidents occur the most common. The most common accidents in bathrooms are slipping and falling. This risk is higher for the elderly. For this reason, the issue of safety is the first question in the design of these spaces (Zorlu, 2017). Grab bars should be installed at appropriate points to prevent the troubles that will be experienced when using the washbasin, water closet and shower and to ensure comfortable usage of these

equipment. Grab bars should be of an easy-to-grip section and placed at a height of 90-100 cm from the floor (Bakker, 1997). Having grab bars in the bathroom is particularly important, especially for individuals who have difficulty standing and sitting, and have joint pain. Here, since this bar is located next to the water closet where we must squat, everyone who has or does not experience the mentioned difficulties can use it. In the meantime, getting support from these bars in cases of balance loss may occur assures safety.

- In the bathroom, there is a foldable shower seat (see Table 3, Fig. 7). Elderly individuals can have difficulties in standing and sitting, especially due to bone and joint pain and other problems they may experience. For this reason, they are included in the disabled status. Since wet areas are places where it is possible to slip and fall, seating elements should be considered for those who have trouble standing in such places and for those who have balance problems. As it can be seen in Figure 7, the presence of a sitting element in the shower area provides a safe environment for the elderly.

- In the living area, the furniture is of appropriate height. Correctly sized seats and chairs should be selected considering ease of use and safety factors so that the elderly does not have difficulty sitting and standing. These seats and chairs should not be too low, too high, or too deep, and they should have armrests to provide support while sitting and standing as seen in the seating element in the Table3-Figure 8. Figure 8 also shows an ottoman used as a footstool. Ottomans are coordinating furniture with armchairs and are used to rest the legs when seated in armchairs.

The negative aspect can be stated as there is no task lighting provided on the fixtures for the elderly with limited vision. In addition, the corners of the chest of drawers are not rounded to reduce the risk of injury during a fall.

With respect to Principle 2: Flexibility in Use; the design should “provide choice in methods of use; accommodate right- or left-handed access and use; facilitate the user's accuracy and precision; provide adaptability to the user's pace” (The Center for Universal Design, 1997).

- In the bathroom, there is an adjustable mirror (see Table 3, Fig. 9). This adjustability allows the person to use as desired according to her/his usage.

- In terms of spatial organization, it is important that the placement of the products-furniture provides sufficient circulation area in the space and at the same time be appropriate for different use. Since the necessary products and furniture are used, and the size of the space is suitable, there is flexibility in the layout of the living areas (see Table 3, Fig. 8).

- In the bathroom, having a shower instead of a bathtub for the elderly is more functional in terms of ease of use, and faucets should be easy to grip and be adjustable (Zorlu, 2017). In the studied living unit, a shower is used instead of a bathtub and there is adjustability in the bathroom fixtures, e.g., adjustable shower headset with a flexible hose is easy to operate (see Table 3, Fig. 10).

- Light switches are located at the entrance of the room and near the bed (see Fig. 5). This provides a choice in methods of the use for the user.

- Depending on the purpose of use, the basic criteria in the design / selection of furniture or product can be listed as functionality, ease of use and accessibility (Zorlu, 2017). The nightstands used in this space allow the person to place his/her belongings next to him/her and

serves as a coffee table with an additional surface. This is also providing choice in methods of use (see Table 3, Fig. 11).

- The top surface of the chest of drawers is movable that adjusts the direction of the television and provides choice in methods of use and adaptability according to the user's needs (see Table 3, Fig. 12).

As a negative aspect, the mirror in some living units is not adjustable and a full-length mirror is not provided that accommodates diverse users.

In Principle 3: Simple and Intuitive Use, the design should “eliminate unnecessary complexity; be consistent with user expectations and intuition; accommodate a wide range of literacy and language skills; arrange information consistent with its importance; provide effective prompting and feedback during and after task completion” (The Center for Universal Design, 1997).

- Wayfinding is easy due to the signage in the corridors (see Table 3, Fig. 13). Since the block number and floor level are given in this sign system, the information is clear and uncomplicated. In addition, the information is legible due to the colors used.

- The push-buttons at the entrance and next to the nightstand are differentiated with different colors. Red is for emergency and green is for calling the caregiver (see Table 3, Figs. 5 & 14). Considering the accidents that may occur in the bathrooms; an Emergency call assistance bell should be placed next to the water closet and in the shower area, one at a height of 10 cm and the other 110 cm above the floor, respectively, as shown in Figure 14 (Savut, 2007).

- The telephone in the living space is easy to use and not complex (see Table 3, Fig. 5). The numbers are easy to see and the buttons are large enough for comfortable finger pressing.

However, as a negative aspect, the writing on the ‘Push Button for Help’ is not in the native language of the users, which does not accommodate literacy and language skills.

According to Principle 4: Perceptible Information, “use different modes for redundant presentation of essential information; provide adequate contrast between essential information and its surroundings; maximize legibility of essential information; differentiate elements in ways that can be described; provide compatibility with a variety of techniques or devices used by people with sensory limitations” (The Center for Universal Design, 1997).

- Visible and legible signage is provided that indicates the block number and floor level (see Table 3, Fig. 13).

- The elderly’s name and the room number are written at the door entrances (see Table 3, Fig.15). This provides the necessary information to the user and to the visitor. In addition, the colors that are used in the signage allow the information to be legible due to the contrast level.

- The entrances of the rooms are differentiated by colored architraves and doors that provide adequate contrast between essential information and their surroundings (see Table 3, Fig. 16).

- The architrave of the bathroom door is differentiated with a color different from the rest of the room that also provides adequate contrast between essential information and its surroundings.

• On both sides of the corridor walls, there are handrails, and they are differentiated from the wall with a different color that makes the essential element legible (see Table 3, see Fig. 17).

As a negative aspect since the writing on the ‘Push Button for Help’ is not in the native language of the users, the information does not communicate necessary information effectively to the user and causes unnecessary complexity. Tactile information or differences in surface materials or textures are provided for the elderly with limited vision.

According to Principle 5: Tolerance for Error, “arrange elements to minimize hazards and errors; provide warnings of hazards and errors; provide fail safe features; discourage unconscious action in tasks that require vigilance” (The Center for Universal Design, 1997).

• An information desk is located at the end of every floor that reduces the risk of getting lost.

• In the living unit, rounded edges and corners are provided on tables, bedposts, bedside tables, and armchairs that shield possible hazards and errors. In addition, it provides safe features.

• There are ‘Push Button for Help’ near the bed side and inside the shower area that refers to the arrangement of elements to minimize hazards and errors, and makes them accessible (see Table 3, see Figs. 5 & 14).

• Non-slip floor surfaces are used in the wet area that reduces the risk of slipping.

• Grab bars mounted on the walls of the shower area increase safety (see Table 3, Fig. 10).

• There is an automatically closing system of the electrical cooking appliances after half an hour that discourage unconscious action in tasks that require vigilance.

• A lighting unit is provided for night use in the corridor area (see Table 3, Fig. 18).

• There is a smoke detector and speaker in the rooms (see Table 3, Fig. 19) and sprinkler system in the corridor that provides warnings of hazards and errors.

The negative aspect can be stated as the rail of the shower’s sliding door can cause trips when getting in and out of the shower area. The elderly’s fingers can be caught in the shower door.

With respect to Principle 6: Low Physical Effort, the design should “allow user to maintain a neutral body position; use reasonable operating forces; minimize repetitive actions; minimize sustained physical effort” (The Center for Universal Design, 1997).

• The wardrobes have sliding doors that provide ease of use. Thus, a reasonable operating force is used.

• The entrance and bathroom doors open easily since they are not heavy, and this refers to minimizing sustained physical effort.

• Telephones next to the bed and in the bathroom reduce mobility (see Table 3, Fig. 5 & Fig. 20)

As the negative aspects, the faucets in the kitchenette can be difficult to open and turn, since they are not lever-type but knob-type. The faucets should be easy to grip and adjustable. There is a cabinet under the sink that minimizes the legroom and the elderly needs to bend down to get something from it, which causes a loss of neutral body position. Likewise, pull-

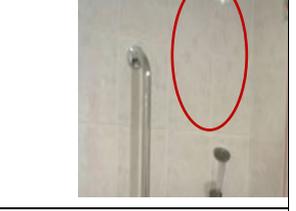
down shelves are not provided in the kitchenette that maximizes physical effort. Opening the lid of the trash bin is difficult; however, it should be easily operable with minimum effort.

According to Principle 7: Size and Space for Approach and Use, the design should “provide a clear line of sight to important elements for any seated or standing user; make reach to all components comfortable for any seated or standing user; accommodate variations in hand and grip size; provide adequate space for the use of assistive devices or personal assistance” (The Center for Universal Design, 1997).

- The corridors are wide enough for 2 people to pass easily (see Table 3, Fig. 17)
- The corridors should be a width of at least 110-120 cm (Zorlu, 2017). For the elderly people using wheelchairs to maneuver comfortably, an area of at least 150cmx150cm should be left in the middle. Again, in terms of safety, particular attention should be paid not to place furniture in these circulation areas. Otherwise, accidents such as crashes and falls may occur. There is a wide circulation area in the living units that provide wheelchairs to maneuver easily (see Table 3, Fig 8).
- There is free knee clearance under the washbasin and reach approach to the washbasin in the living units (see Table 3, Fig. 9).
- Lever-type faucets (see Table 3, Fig. 9) and lever type handles are used that accommodate variations in hand and grip size.
- There are open-loop type handles for drawers and wardrobes (see Table 3, Fig. 11 & Fig. 12)
- There is a small storage area within the shower area for placing soap and other accessories that allows adequate space for the use of assistive devices or personal assistance (see Table 3, Fig. 10).

However, the bathroom is challenging for the wheelchair users because there is a threshold at the bathroom entrance. Whereas, as stated before, for the elderly using wheelchairs to maneuver comfortably, an area of at least 150cmx150cm should be left in the middle. In addition, there is limited space for a wheelchair user to maneuver in the kitchenette. Bathroom and toilet doors should be opened as far out as possible (to the corridor, hallway or bedroom). If it is inevitable to open into wet areas; then, a clean area of at least 80 cm x 120 cm should be left outside the sweeping area of the door in the direction the door opens (Zorlu, 2017). The bathroom door in the studied living unit opens inwards that reduces the clear space for maneuvering inside the bathroom. The kitchenette countertop is small that makes it difficult to place personal accessories. The storage space and the area within the shower area are limited. It is hard for an elderly to move freely and a caregiver to assist him/her within the shower. Details that will allow sitting in the kitchen when necessary should be resolved. Storage areas should be positioned to ensure easy access. For elderly users, it is preferred that the height of the shelves in the lower cabinets should be at least 40 cm due to the difficulties in bending and bending the knees. For ease of use and safety, cabinets should not be placed under the counter; it is important for the wheelchair users to put their legs under the counter and control the food cooked on the stove (Savut, 2007). In the studied living unit, the elderly cannot use the top shelves of the cupboards due to the height and there is no open shelving for cupboards (see Table 3, Fig. 4).

**Table 3. Photographs Taken from The Evaluated Living Units in Context of UDPs (Photographs were taken by the researcher).**

			
<b>Figure 3.</b>	<b>Figure 4.</b>	<b>Figure 5.</b>	<b>Figure 6.</b>
			
<b>Figure 7.</b>	<b>Figure 8.</b>	<b>Figure 9.</b>	<b>Figure 10.</b>
			
<b>Figure 11.</b>	<b>Figure 12.</b>	<b>Figure 13.</b>	<b>Figure 14.</b>
			
<b>Figure 15.</b>	<b>Figure 16.</b>	<b>Figure 17.</b>	<b>Figure 18.</b>
			
<b>Figure 19.</b>	<b>Figure 20.</b>		

## DISCUSSION AND CONCLUSION

All over the world, the rate of elderly population is increasing every year. In the elderly period, it becomes difficult to continue daily activities due to the physiological, psychological and biological regressions. Depending on these difficulties, the elderly is considered as individuals in the category of disability, and service areas for the elderly are becoming critical. When home care of elderly people becomes difficult, institutional elderly houses step in to support them. Institutional house is accepted as a facility for the residential care of the elderly. Multiple design features may improve the physical and mental wellbeing of elders, especially in the residential space that they live. Among these are what have come to be known as features of UD.

UD can be defined “as the design of products and environments that can be used and experienced by people of all ages and abilities, to the greatest extent possible, without adaptation” (The Center for Universal Design, 1997). Burgstahler (2007) stated that UD can be applied to physical spaces to provide environments that are welcoming, comfortable, accessible, attractive, and functional. For achieving this environment, specific considerations are made for such as climate, entrances and routes of travel, furniture and fixtures, information resources and technology, and safety. Thus, UDPs are applied to all disciplines of design, such as those that focus on built environments, products, and communications. The principles were denoted to guide the design process. With the application of UD, individuals with and without disabilities can use the same environments without any segregation. UD is characterized by the seven principles that are equitable use, flexibility in use, perceptible information, simple and intuitive use, low physical effort, tolerance for error, size and space for approach and use (see Table 1).

In this study, the focus was on the interior space where elderly individuals live and how the products that exist in this space respond to the use of the elderly individuals. The aim of this study was to analyze and evaluate the living units and products that constitute the space for the use of elderly individuals who are in the disabled category in context of UDP. In addition, it was aimed to underline the concept of inclusion of elderly in life and to emphasize the importance of supporting their activities of daily living at normal standards without excluding them from other individuals without disabilities. For this purpose, this study has been formulated as a qualitative field study in an institutional elderly housing located in Ankara, Turkey. The research data were obtained by analyzing a living unit in the determined institutional elderly housing with respect to the UDPs.

The living spaces and the products that exist in this living unit was evaluated according to the UDP with its positive and negative aspects. The evaluations were made with the elderly being the determining factor in the design and being accepted as a base to the human interaction with the built environment and products. At all stages of the design process especially before the introduction of new products, designers should make evaluative research with respective groups of elderly users (Demirbilek - Demirkan 2004; Sandhu, 1993).

As a result of the evaluations, positive and negative aspects were identified according to the UDPs in the living units where the fieldwork was carried out. These evaluations are explained in the findings section, supported by details and photographs. Although it is observed that design decisions are made considering that elderly people will live here, it is seen that there is not much attention given to the UDPs at some points that may be very critical for the elderly. First of all, it is seen that the use of support elements is not considered, as the elderly especially have joint and bone pain. It has been observed that the required dimensions for maneuvering in areas cannot be achieved, especially considering wheelchair users. In addition, especially in the kitchen/kitchenette, details that will allow sitting when necessary should be resolved. Kitchen counter tops should be at varying levels to accommodate standing and seated users, and people of varying heights (Carr, et al. 2013). The kitchen here must also comply with these criteria.

There are grab bars available in the bathroom. Especially this bar is located next to the water closet for individuals who experience joint problems. In addition, it provides safety for individuals who may experience loss of balance. At the same time, the elderly is supported,

especially where safety is important such as ‘Push Button for Help’ near the bed side and inside the shower area; the usage of non-slip floor surface reduces the risk of falling in the wet cores; automatically closing system of the electrical cooking appliances; a lighting unit for night use at the corridor.

Conditions such as the decrease in auditory and visual perceptions, coordination, and balance disorders, decrease in strength that occur with aging cause the elderly to perform their daily activities difficult and to face dangers. For this reason, it is important in terms of human rights that elderly individuals continue their lives as individuals without disabilities without being dependent on anyone, supported by design. It is valuable to approach space design and product design from this point of view. In the organization of residential interior spaces, the spaces should be positioned correctly considering the frequency of use and requirements.

In line with the function of the space, taking into account the ergonomic design criteria of the action areas for the elderly; observing visual, auditory and thermal comfort conditions; the design should be planned with dimensioning fixed or movable furniture, by taking into account the anthropometric features of the elderly users and the applications should be implemented carefully. All these suggestions and requirements shows the necessity to pay attention to UDPs in every field and to use the criteria as a guideline in both space design and product design. Thus, the principles must be intended to guide the design process.

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