

# International Handbook of Occupational Therapy Interventions

# Chapter 14

## Universal Design: Principles and Practice for People with Disabilities

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*Application of universal design principles improves environmental access for people with disabilities.*

**Abstract** People with disabilities are dependent on or function best with adaptations to environments, which enable them to function optimally and perform daily activities. However, many of these adaptations would not be necessary if universal design was applied to environments as a standard. Outlined in seven principles, universal design may be applied to environments to improve everyday functioning. In so doing, universal design improves access for people with and without disabilities (Bowe, 2000; Burgstahler, 2001; McGuire et al., 2001).

Examples for application of universal design in occupational therapy environments and sessions are described. These principles may be used to maximize client access and intervention outcomes. Applications of universal design principles are consistent with occupational therapy values and assists OTs in meeting the therapeutic needs and potential of all our clients regardless of their disabilities or learning differences (Bowe, 2000; Burgstahler, 2001).

**Keywords** Access • Adaptation • Occupation • Universal design • Usability.

### Definitions

*Universal design* is “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” (North Carolina State University, the Center for Universal Design, 2008).

*Occupation* is any purposeful, meaningful, and productive activity that is occupying people’s time. This means that whether a person is grocery shopping, working at a computer, or gardening, each is engaged in occupation (Christiansen and Baum, 1997). Such occupation may be functionally enhanced with the use of universal design.

## **Background**

People with disabilities are dependent on or function best with adaptations to environments, which enable them to function optimally and perform daily activities. However, many of these adaptations would not be necessary if universal design was applied to environments as a standard.

Universal design embodies multiple means of improving every day functioning. In so doing, universal design improves access for people with and without disabilities (Bowe, 2000; Burgstahler, 2001; McGuire et al., 2001).

For example, people using wheelchairs, as well as those carrying packages and pushing shopping carts, appreciate automatic doors. In addition, curb cuts, ramps, lights on movement sensors, and adjustable tables and chairs provide maximum access and usability to all people depending on their situation and need. Products of universal design have improved access for people with a wide range of disabilities (Burgstahler, 2001; McGuire et al., 2001).

Application of the principles of universal design are consistent with occupational therapy values of client-centered care, the concepts of which include provision of flexible approaches, person-centered service and communication, and encouragement of active involvement in tasks in relationship to personal and environmental needs (Law et al., 2002).

While concepts of universal design are familiar to occupational therapists (OTs), universal design is too seldom incorporated in the occupational therapy interventions regarding assessment and planning of environmental adaptations. Therefore, when applied to occupational therapy intervention as standard, clients may need fewer specific adaptations.

## **Purpose**

The purpose is to improve the understanding of (1) the principles of universal design by OTs, (2) how these principles may be applied in occupational therapy interventions aimed at enhancing disabled people's usability of their surrounding environments.

## **Results**

### ***The Role of the Occupational Therapist***

The occupational therapist's ultimate role is to assist disabled people in achieving the optimal level of occupational functional performance in self-care, work, and leisure activities. Clinical applications of universal design require the OT's understanding of (1) the seven universal design principles; (2) their advantages for clinical use; and (3) how they should be applied in order to structure the clients' intervention

sessions, and to enhance functional advantage through use of additional and specific accommodations among people with disabilities.

### ***Clinical Application***

There are seven universal design principles that, when applied, reduce the client's physical, sensory, and cognitive barriers that are imposed on the therapeutic environment. Specifically, interventions are provided in environments and methods that adapt for physical, sensory, and cognitive impairments for the vast majority of clients; thus, the need for specific accommodations for the client may be reduced.

The seven principles guiding the design of the client's environmental structures are as follows:

#### **Equitable Use**

Equitable use means that the "design is useful and marketable to people with diverse abilities" (North Carolina State University, the Center for Universal Design, 2008). This requires that the design provides equality, privacy, security, and safety; avoids segregating or stigmatizing; and is appealing and available to all users.

Applying the principle of equitable use in occupational therapy intervention environments is easily accomplished when considering the environment and provision of information through means that will meet the needs of the majority of individuals, irrespective of their disability. For example, intervention environments in wheelchair-accessible private rooms provide ample private physical space with soundproofing to allow for cognitive focus in a quiet, nondistracting environment for an individual with a traumatic brain injury who may have both physical and cognitive impairments. In a different intervention session, a nondistracting intervention-friendly environment with enough physical space allows for a person who transports himself in a wheelchair and also needs portable oxygen apparatus to perform activities of daily living (ADLs) or to learn energy conservation.

#### **Flexibility in Use**

Flexibility in use means that the "design accommodates a wide range of individual preferences and abilities" (North Carolina State University, the Center for Universal Design, 2008). The design requires that the users be free to make their choice in the performance method that is most appropriate for their functioning. The design should facilitate accuracy and precision, accommodate to right- or left-handed access and use, and be possible to adapt to the user's pace.

The flexibility principle may be applied; thus, the OTs use pictorial instructions for home exercise and energy conservation programs instead of written ones.

This is suitable, for example, to clients suffering from a decreased ability to understand spoken language. Here, multiple sensorial modes of presentation serve to enhance the learning process by providing information understandable to all individuals regardless of their learning style. Another example of flexibility design is the use of a pair of scissors, which is designed for use with either hand.

### **Simple and Intuitive Use**

Simple and intuitive use is the “the design that is easy to understand, regardless of the user’s experience, knowledge, language skills, or current concentration level” (Canadian Association of Occupational Therapists, 1990). The design should not be complex, and should give prompting and feedback during use of the object. The instructions for use should be stated in various ways in a wide range of languages, and should meet the users’ expectations and intuition (North Carolina State University, the Center for Universal Design, 2008).

Application of the simple and intuitive principle means that standard and familiar structures and formats should be used. Equipment should be straightforward to use and understand. For instance, microwaves placed in the kitchen of the occupational therapy department should require a simple two-step standard operation. Use of equipment is verbally described by therapists and additionally displayed in large, bold, clear print and demonstrated with pictures. The key is to be intuitive and usable for the majority of individuals using the object or equipment.

### **Perceptible Information**

Perceptible information is the design that “communicates necessary information effectively to the user, regardless of ambient conditions or the user’s sensory abilities” (North Carolina State University, the Center for Universal Design, 2008).

Perceptible information should be usable by people with sensory limitations. Ensuring perceptible information during instruction means that information is provided in a variety of modes (pictorial, verbal, tactile) to address varied sensory abilities. For example, visual information is provided through a variety of means, such as written handouts with pictorials or on screens where the letter font is easily increased. The design should allow legibility of essential information; that is, a great contrast between the information and the surroundings is required. Auditory information is provided through auditory sources such as oral explanation, or audiotape, or CD to allow for repetition of information. Kinesthetic information is provided through compatibility with a variety of techniques or devices such as experiential exercise or by hands-on guidance. The aim is to guide the client to use the correct technique and improve motor memory learning for performing various activities. Providing perceptible information in a variety of formats ensures the highest level of comprehension and learning for all individuals regardless of ability or disability.

## **Tolerance for Error**

“The design minimizes hazards and the adverse consequences of accidental or unintended actions” (North Carolina State University, the Center for Universal Design, 2008). It is required that the elements of objects are safely designed so that there are warnings for minimizing hazards and errors.

The most clear-cut example of applying this principle in occupational therapy interventions is the OTs’ tolerance for human variance and mistakes. Far too often OTs claim that clients “fail to comply” with exercise programs or with activities of daily living (ADL) intervention expectations, but they do not consider clients’ personal factors or life events. Being tolerant of errors indicates that OTs allow for and understand human variance in cognitive ability, learning style, and the interference of other life factors when clients are learning programs and new routines. The need for and practice of nonjudgmental repetition and retraining is understood and expected in standard procedures. When educating clients, applying the principle of tolerance of error entails asking: “Where did the training fail?” This approach examines the effectiveness of our interventions and allows for client variation in understanding and response, rather than to assume that the client merely failed.

## **Low Physical Effort**

Low physical effort means the “design can be used efficiently and comfortably and with a minimum of fatigue” (North Carolina State University, the Center for Universal Design, 2008). This implies that the design should minimize sustained physical effort and use minimal operating forces, and the performances should be done in a neutral position.

Application of this principle of universal design requires that no excessive energy output be required. Energy conservation techniques are accessible by all. For example, an automatic door entry to the clinic allows for wheelchair, walker, and cane users to access it with little effort. In addition, the clinic space is fully accessible by wheelchair and has both wide aisles and linoleum for ease of mobility.

## **Size and Space for Approach and Use**

A size and space suitable for approach and use means that the “appropriate size and space is provided for approach, reach, manipulation, and use regardless of the user’s size, posture, or mobility” (North Carolina State University, the Center for Universal Design, 2008).

Using this principle requires that the objects used for standing and seating allow a clear line of sight and ability to reach other components. The design should accommodate variations in hand and grip size and the environmental space for the use of assistive devices, or personal assistance should be enough.

Universal design requires that clinic spaces be of appropriate size for access. Tables, computer stations, and chairs should be adjustable in height to allow ease of use. Equipment is likewise placed on adjustable-height tables for ease of use by all.

Intervention and mat tables are electronically adjustable for ease of use by staff with a variety of client physical needs. Environmental considerations include, yet are not limited to, adequate space allotted for wheelchair mobility and positioning of objects (e.g., phones, desks, tables, equipment, and supplies) in the physical environment to facilitate access. In addition, items on shelves are placed in easy reach from a seated or wheelchair position. Workstations are ergonomically designed with adjustable chairs, tables, keyboard trays, and monitor stands.

### ***Benefits of Universal Design***

Use of universal design has many advantages. It requires less specific adaptation for individuals with disabilities. Individuals with *orthopedic or neurologic impairments* who use wheelchairs find structures and equipment in proximity and easy to use. Individuals with *low vision* are able to perceive information within their functional range of sight when large print and high contrast in written materials are provided as standard practice. Individuals with *impaired hearing* are able to better hear and understand therapist's instructions when distracting background noise is eliminated. Individuals with *cognitive deficits* learn more readily when repetition and multisensory information is routinely provided. In addition to these functional benefits, additional accommodations for individuals may be avoided, thus providing a cost savings for therapy departments. For instance, ergonomic workstations decrease repetitive work injuries and the need for specific environmental adaptations per individual.

### ***Accommodations in Addition to Universal Design***

Despite the many advantages of the application of universal design principles, some individuals with disabilities will still require accommodations. Examples are (1) a deaf client who needs a sign language interpreter, (2) a client who is an upper extremity amputee and needs a one-handed keyboard, and (3) a blind client who needs a Braille system for written communication.

## **Discussion**

The advantage of universal design is that it enables client function and therapeutic benefit regardless of ability, thus decreasing the need for specific accommodations. Universal design reflects OTs' ethical values of regarding each person as unique

and worthy of individual experiences within the larger societal spectrum, and assists in meeting the therapeutic needs and potential of all clients regardless of their disabilities or learning differences (Bowe, 2000; Burgstahler, 2001).

Application of the seven principles of universal design in occupational therapy adaptive interventions holds the potential of being an effective method of ensuring that all clients have full access to the interventions without disadvantage. Research is needed to both quantitatively and qualitatively determine specific benefits of universal design for clients with a variety of disabilities, and in a variety of therapeutic settings.

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