



Choosing strength-training equipment for older adults: the benefits and advantages of Universal Design

These evidence-based principles and guidelines support appropriate equipment purchase decisions

by Wayne T. Phillips, PhD, FACSM

In recent years there has been an increasing focus on the value of maintaining and increasing independence for older adults. This has occurred across a broad spectrum of the aging market, including senior centers, community centers and fitness centers. This same focus has also been seen in a broad range of senior housing, particularly continuing care retirement communities (CCRCs) and assisted living communities, where aging in place is a paramount aspiration. The positive contribution of exercise—particularly strength training—in maintaining

and improving independence and quality of life is now unquestioned. As a result of this, fitness and community centers are increasingly looking to cater to an aging clientele, while strength training, “fitness rooms” and/or wellness centers are becoming an accepted part of senior housing facilities and programming focused on this population.

The type of equipment purchased can make a major contribution to the success of any strength-training program for older adults. At the most basic level, if equipment is attractive, safe and easy to use, classes and participation generally are far more likely to begin and to continue. However, choices and purchase decisions for strength equipment often need to be made by individuals who have little or no experience or expertise in the use or operation of such equipment by older adults. This article presents evidence-based principles and guidelines that will enable intelligent and appropriate equipment purchase decisions to be made. These guidelines provide a template for a professional assessment of the equipment’s safety, ease of use and appropriateness for the desired population.

Aiming for a positive user experience

The design of any fitness/wellness center and any strength-training equipment has an overarching goal of maximizing the user experience, so as many individuals as possible will use, and continue to use, the equipment. The first basic step in achieving this goal is to be aware that there is a wide range of physical abilities in the older-adult population¹—even wider than that found with younger adults. This is partly due to age-related increases in the number and frequency of diseases such as arthritis, osteoporosis and diabetes, and partly due to muscle loss or muscle weakness due to inactivity. Equipment that is specifically designed to take account of these conditions is far more likely to

attract and retain users than equipment with a generic “one size fits all” design.

The major concerns are to maintain user safety while at the same time supporting ease of use, so there is little or no difficulty in using (or figuring out how to use) the equipment. There is a great deal of research out there that tells us that the “transient feelings” of participants—that is, how they feel during and/or following even a single exercise session—can be a major influence on whether or not they will continue to exercise.² In other words, the easier it is to use the equipment, the more likely people are to keep coming.

With equipment, the essential question to ask is: “How easy is it to use?” One evidence-based guideline that will help to answer this question is how closely the equipment fits with the principles of Universal Design.

Universal Design: an overview

Universal Design is a relatively new concept that was initially developed to provide accessibility for people with “disabilities.” Introduced at a ramps-for-wheelchairs level, Universal Design today is a broad-spectrum solution that has taken a distinctly marketing approach, which recognizes that selling depends as much on how something looks as it does on how well it works. The result has been an explosion in consumer goods that are not only utilitarian, but fashionable and even “cool”—appealing to a wide range of customers whether limited in mobility or not. Think of easy grip pens, touch-free can openers, contemporary kitchen layouts, cupboards and shelf systems. Universal Design is on the rise and can be found in an increasing number of industries.

Over the last several years, Universal Design has expanded into the aging market, aiming to provide aging-in-place solutions to older adults who have diffi-

culty in performing activities of daily living previously taken for granted. Examples include twisting off lids, getting up stairs, rising from chairs, opening doors, and the like. One area of the aging market that this concept has yet truly to enter—and for which I make the case here—is in the design of strength-training equipment.

Although there has been some use of the term *senior friendly* relating to strength-training equipment, this label is unappealing to many older adults and may even be viewed by some as discriminatory and somewhat demeaning. *Age friendly* seems to be a more acceptable descriptor, though the term still carries with it an element of “separateness.” Universal Design, on the other hand, is a term chosen to represent an equitable, “inclusive” and nondiscriminatory approach to the design of all products and environments.

The Center for Universal Design at North Carolina State University (CUD) defines Universal Design as follows:

“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.”

CUD lists seven principles as a template for achieving this goal, and I have included the full list of the original Universal Design principles with their accompanying guidelines in Appendix I on page 62.

For the purposes of this article, I have taken each of these original principles and applied them for the first time to the design of strength-training equipment, so they may serve as a proactive “primer” to make appropriate and definitive equip-

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ment choices. I have also presented them in a similar format to that of the CUD as follows:

- *name of the principle*, intended to be a concise and easily remembered statement of the key concept embodied in the principle
- *definition of the principle*, a brief description of the principle's primary directive for design
- *guidelines*, a list of the key elements that should be present in a design for strength-training equipment that adheres to the principle

Note: This is my interpretation of these principles (see disclaimer below).³

Universal Design principles applied to strength-training machines

Principle 1: Equitable Use

The design is useful and marketable to people with diverse abilities (see Figure 1).

Guidelines:

1. Is appealing to the eye and un intimidating.
2. Provides the same means of use and access for all users—identical where possible, equivalent if not.
3. Seats and benches are wide enough to provide good stability for all users.

Principle 2: Flexibility in Use

The design accommodates a wide range of individual preferences and abilities.

Guidelines:

1. Can be set for single or double limb use.
2. Resistance increments can be graduated in 5 lb. (or smaller) increments.
3. Is suitable for, and adjustable to, any size, height or range of movement.

Principle 3: Simple and Intuitive Use

Use of the equipment is easy to understand, regardless of the user's experience,

Design Principle 1: Equitable Use



- Appealing to eye and un intimidating
- Walk-in design—easy access for all
- Ratcheting seat backs and seat bottoms
- Wide seats and backs for stability

Figure 1. Strength-training equipment design should allow equitable use by people with diverse abilities (Universal Design Principle 1). Image courtesy of Precor, Inc.

knowledge, language skills, or concentration level.

Guidelines:

1. Use and adjustment are simple, straightforward and eliminate any unnecessary complexity.
2. Number of adjustments needed to change resistance is minimized.
3. Information and/or instructions are displayed on equipment and arranged consistent with their importance.

Principle 4: Perceptible Information

The equipment communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.

Guidelines:

1. Visual and/or audio feedback is available for all users to monitor repetitions, sets and resistances.
2. Programs can be stored in computerized form for continued access.
3. Equipment has bright, clearly illustrated written instructions in at least 14-point font and/or embedded video screen displays for instructions or feedback.

Principle 5: Tolerance for Error

The design minimizes hazards and the adverse consequences of accidental or unintended actions (see Figure 2).

Guidelines:

1. Jamming or tripping hazards are eliminated.
2. Weight stack is shielded for privacy and safety.
3. Clear warnings are posted where necessary.

Principle 6: Low Physical Effort

The design can be used efficiently and comfortably, with a minimum of fatigue.

Guidelines:

1. Allows the user to maintain a comfortable body position and a neutral spine.
2. Adjustment mechanisms and levers are low friction, easily accessed and operated from the lift starting position.
3. Movement of weight stacks or lifting arms is smooth and continuous.

Principle 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 (see Figure 3).

Guidelines:

1. User is able to comfortably attain lifting position and be able to reach all adjusting systems while seated in equipment.

Design Principle 5: Tolerance for Error



- Machine name on front and back for easy identification
- Weight stack shielded for privacy and safety
- Jamming and tripping hazards eliminated
- User adjustments color-coded orange for easy identification

Figure 2. Equipment design should shield users of strength-training equipment from the consequences of unintended actions (Universal Design Principle 5). Image courtesy of Precor, Inc.

2. All levers and handles are in line of sight and able to accommodate variations in hand and grip size.
3. Adequate circulatory space is available between equipment pieces.

The CUD authors also add the following caveat to the original seven principles, which can also be applied to the design of strength-training equipment:

“Please note that the Principles of Universal Design address only universally usable design, while

the practice of design involves more than consideration for usability. Designers must also incorporate other considerations such as economic, engineering, cultural, gender, and environmental concerns in their design processes. These Principles offer designers guidance to better integrate features that meet the needs of as many users as possible.”

Making an informed purchase decision

Purchasing equipment is one of the biggest financial decisions to be made in any fitness/wellness center, and not one to be taken lightly. Yet often decisions on purchases are made sight unseen, or based largely on photographs in equipment catalogues or the recommendations of a sales representative.

Below is a list of suggested questions and approaches aimed at gathering pertinent information in order to make a more informed purchase decision. This is not an exhaustive list and some suggestions may not be suitable for all situations (similar to the Universal Design principles themselves). These questions—and others that may arise out of your particular situation—should be framed within the context of the Universal Design principles listed above, and with the needs and goals of your target population in mind.

Sales representatives

Question your sales representatives closely. Ask them if their companies have modified their equipment to take account of Universal Design principles, and if so, can they highlight and discuss their equipment’s features in the context of Universal Design.

Focus groups and interviews

Your group(s) and interviewees should be regular participants in strength training. Focus here more on what they like—and

Design Principle 7: Size and Space for Approach and Use



- Adjustment levers are smooth and low friction
- Levers are in line of sight and able to accommodate variations in hand and grip size
- Easily accessed and operated from seated position
- Adjustment range clearly numbered for easy identification and repeatability between workouts

Figure 3. Features should provide enough size and space for all users to approach and use the strength-training equipment (Universal Design Principle 7). Image courtesy of Precor, Inc.

what they would like to see—in particular machines, rather than what they don’t like. Focusing on positive (rather than negative) aspects of equipment usage will ultimately lead to more productive and applicable decision-making information.

Site visits and ‘eyeballing’

Ask to visit an actual working installation. It will be informative to see what the equipment actually looks and feels like in use. How comfortable do users look and feel when entering and using

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the machines? Walk around—is the equipment appealing to the eye and unthreatening? Take some of your residents or members with you and ask for their reactions.

Testimonials

Does the company you are considering have any testimonials from users? Are they available for further information, if necessary? Do they provide live contact information, so you can follow up by phone or in person if appropriate?

Kick the tires

Use the equipment yourself. How do these Universal Design principles play out when you—and your fellow decision-makers—actually use the machines? If you have difficulties with any aspect of usage, imagine what some of your older, weaker users will feel. If possible, bring some of your residents or members with you. How do they feel when using these machines?

Final thoughts

Equipment constructed according to Universal Design principles would be a major contribution to maximizing the user's experience in any exercise situation. Although I am aware of no equipment manufacturer marketing a specific Universal Design range of machines in North America, some are certainly moving in this direction. From a business perspective, it is becoming clear that there are potentially enormous benefits for manufacturers to do so. Some of these benefits include:

- an increase in market size
- a widening of customer base
- a highly targeted market
- a potential decrease in equipment costs and equipment usage
- a decrease in staff assistance
- a decrease in staff training
- a wider range of equipment

The Inclusive Fitness Initiative⁴ (IFI) in the United Kingdom has led the way in

this particular aspect of equipment design, with several companies from the United States sponsoring that initiative. If potential purchasers educate themselves on Universal Design principles and use these principles to guide purchase decisions, it can be just a matter of time until such principles are widely implemented here in North America, to the greater benefit of all. 🌀

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3. "The Principles of Universal Design were conceived and developed by The Center for Universal Design at North Carolina State University. Use or application of the Principles in any form by an individual or organization is separate and distinct from the Principles and does not constitute or imply acceptance or endorsement by The Center for Universal Design of the use or application." <http://www.design.ncsu.edu/cud>.
4. For more details of the IFI, see <http://www.inclusivefitness.org>.

Appendix I

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Compiled by advocates of universal design, listed in alphabetical order: Bettye Rose Connell, Mike Jones, Ron Mace, Jim Mueller, Abir Mullick, Elaine Ostroff, Jon Sanford, Ed Steinfeld, Molly Story, and Gregg Vanderheiden

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UNIVERSAL DESIGN:

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 authors, a working group of architects, product designers, engineers and environmental design researchers, collaborated to establish the following Principles of Universal Design to guide a wide range of design disciplines including environments, products, and communications. These seven principles may be applied to evaluate existing designs, guide the design process and educate both designers and consumers about the characteristics of more usable products and environments.

The Principles of Universal Design are presented here, in the following format: name of the principle, intended to be a concise and easily remembered statement of the key concept embodied in the principle; definition of the principle, a brief description of the principle's primary directive for design; and guidelines, a list of the key ele-

THE PRINCIPLES OF UNIVERSAL DESIGN

ments that should be present in a design which adheres to the principle. (Note: all guidelines may not be relevant to all designs.)

PRINCIPLE ONE: Equitable Use

The design is useful and marketable to people with diverse abilities.

Guidelines:

- 1a. Provide the same means of use for all users: identical whenever possible; equivalent when not.
- 1b. Avoid segregating or stigmatizing any users.
- 1c. Provisions for privacy, security, and safety should be equally available to all users.
- 1d. Make the design appealing to all users.

PRINCIPLE TWO: Flexibility in Use

The design accommodates a wide range of individual preferences and abilities.

Guidelines:

- 2a. Provide choice in methods of use.
- 2b. Accommodate right- or left-handed access and use.
- 2c. Facilitate the user's accuracy and precision.
- 2d. Provide adaptability to the user's pace.

PRINCIPLE THREE: 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.

Guidelines:

- 3a. Eliminate unnecessary complexity.
- 3b. Be consistent with user expectations and intuition.

3c. Accommodate a wide range of literacy and language skills.

3d. Arrange information consistent with its importance.

3e. Provide effective prompting and feedback during and after task completion.

PRINCIPLE FOUR: Perceptible Information

The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.

Guidelines:

- 4a. Use different modes (pictorial, verbal, tactile) for redundant presentation of essential information.
- 4b. Provide adequate contrast between essential information and its surroundings.
- 4c. Maximize "legibility" of essential information.
- 4d. Differentiate elements in ways that can be described (i.e., make it easy to give instructions or directions).
- 4e. Provide compatibility with a variety of techniques or devices used by people with sensory limitations.

PRINCIPLE FIVE: Tolerance for Error

The design minimizes hazards and the adverse consequences of accidental or unintended actions.

Guidelines:

- 5a. Arrange elements to minimize hazards and errors: most used elements, most accessible; hazardous elements eliminated, isolated, or shielded.
- 5b. Provide warnings of hazards and errors.
- 5c. Provide fail safe features.
- 5d. Discourage unconscious action in tasks that require vigilance.

PRINCIPLE SIX: Low Physical Effort

The design can be used efficiently and comfortably and with a minimum of fatigue.

Guidelines:

- 6a. Allow user to maintain a neutral body position.
- 6b. Use reasonable operating forces.
- 6c. Minimize repetitive actions.
- 6d. Minimize sustained physical effort.

PRINCIPLE SEVEN: 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.

Guidelines:

- 7a. Provide a clear line of sight to important elements for any seated or standing user.
- 7b. Make reach to all components comfortable for any seated or standing user.
- 7c. Accommodate variations in hand and grip size.
- 7d. Provide adequate space for the use of assistive devices or personal assistance.

Please note that the Principles of Universal Design address only universally usable design, while the practice of design involves more than consideration for usability. Designers must also incorporate other considerations such as economic, engineering, cultural, gender, and environmental concerns in their design processes. These Principles offer designers guidance to better integrate features that meet the needs of as many users as possible.