

Home Modifications and Products for Safety and Ease of Use

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Over the course of our lives, many of us will experience home environments that no longer help, but rather hinder, our activities. Whether temporary or permanent, gradual or sudden, we may find that stairs, tubs, or kitchens have become hard or impossible to use safely. Some of these problems may arise because of disabling conditions.

Disabilities come in a wide variety of forms and often in combinations. Some disabilities are acquired through accidents or disease processes while others are congenital and present since birth. Changes can occur at any time during life however, the aging process and the inevitable changes in our bodies is something we all will become familiar with. A disability can be slight or can result in the total inability to perform a task. All our senses can be affected and often a decrease in function in one area such as touch can manifest itself in the inability to grasp an object without crushing it or to find a doorknob in the

dark. Our cognitive abilities or "the act or process of knowing including both awareness and judgment" may be affected, creating a myriad of functional difficulties. Cognitive disabilities can affect all the senses, movement, balance, information processing, and speech in many combinations.

Such problems can have significant implications for carrying out routine activities around the home. The problems and their implications need not prevent people from enjoying life and independent living, however. Basic home modifications and well-designed products can facilitate independent living and privacy. They can save time, promote ease of use, and offer convenience. They can add to a home's safety too.

This booklet suggests numerous modifications and products that can help when one's abilities or physical conditions change. Most of the suggestions address mild- to moderate-level problems, which are more typical than severe ones. For example, more suggestions apply to low vision than to total blindness, more to hearing impairment than to profound deafness.

The descriptions of likely issues, the discussions of implications for home activities, and the many suggestions are not intended to be comprehensive. Rather, they are meant to alert consumers, family members, friends, rehabilitation and remodeling industry professionals, and others to possible issues and related options.

Hearing

Issues

People who have trouble hearing may not be able to hear many sounds, particularly soft ones. Alternatively or additionally, they may not be able to hear high tones, low tones, or both. When listening to speech, they may not be able to understand certain words containing higher-pitched consonants. Further, they may have difficulty distinguishing specific sounds when background noise is present or multiple conversations are going on. They may also have difficulty locating the source of sounds.

Implications for Home Activities

Around the home, these issues imply difficulty hearing routine alerts, such as those from doorbells and telephones that herald callers, or those from alarm clocks and timers that signal "Wake up" or "Check the roast." Of greater concern, people with hearing problems may have trouble hearing warnings, say, from smoke and fire alarms. They may have difficulty understanding face-to-face conversations, or voices on the telephone and on media such as the television and the radio.

Suggested Modifications

One strategy for modifying the home to address hearing issues is to make auditory signals louder. For example, household members might add an amplifying device to an existing telephone or replace an existing telephone with an amplified one.

When amplification is not sufficient or possible, an alternative approach is to replace auditory signals with other sensory signals. Examples of visual signals replacing auditory ones are

a simple flashing light attached to a doorbell or a timer, and a strobing smoke alarm (the pulsing effect of the strobe distinguishing it from the simple flashing light and helping to communicate the notion of alarm). Another illustration is a TDD (telecommunications device for the deaf), which enables a person who is deaf to communicate over the telephone. An example of a tactile signal replacing an auditory one is a sound-activated device that shakes the bed, rousing a person who is resting or sleeping.

Still another strategy is to try to decrease background noise. Following this approach, a handy household member or a professional might install insulating materials around noisy appliances like dishwashers and washing machines. Install insulating materials on floors (e.g., soundproof subflooring, covered with carpeting) or try to improve the home's acoustics to reduce the transfer of sound between levels of the home.

Vision

Issues

Vision problems may make it difficult for people to pick out details in their environment. Things may look foggy. People may be able to observe only large items, or to distinguish only shadow and light. Glare from highly polished floors and highly reflective wall coverings may be blinding, as may bright light from direct lighting or from windows. People may not be able to see adequately at low levels of lighting. Further, their eyes may not respond quickly to abrupt changes in levels of lighting. For example, they may be unable to see well when

entering a dark area from a well-lighted one. Depth perception too, may change.

Implications for Home Activities

In the home these various issues may mean difficulty reading clocks, telephone dials or touch pads, appliance labels and controls, and thermostats. They also suggest trouble reading printed material in general—recipes, labels on packaged foods and cleaning containers, newspapers, books, telephone directories, and prescription medicine labeling. The trouble thus extends to many home activities, among them, cooking, cleaning, self-education, leisure reading, communication, health and safety.

Another implication is that people may not be able to see steps or to judge the height or the depth of stair treads. Further, they may not be able to see where one wall meets another or where a wall meets the floor.

Suggested Modifications

Many home modifications to accommodate a person with low vision employ a strategy of enhancing eyesight by providing more lighting. A handy household member might introduce *task lighting* (heightened or special illumination of selected spaces) in the kitchen, in reading areas, in the bathroom, and on the stairs. Among the possibilities are stick-on or screw-in fluorescent lighting under kitchen cabinets and along stairwells and hallways; plug-in wall sconces or lamps; and plug-in ceiling swag lights. Light switches that glow in the dark are also available, as are *rheostats*, devices that adjust the intensity of lighting (for more or less brightness, as needed). A skylight can illuminate even the darkest room. Less costly than a

skylight but giving the effect of one is a new technology, the *light tube*, a packaged lighting device that can be installed through a roof.

Another set of modifications uses the strategy of glare reduction. In this category some possibilities are blinds or shades, or coating on windows, nonglare or low-gloss finishes on floors, and textured wallpaper or matte paint on walls.

Replacing visual cues with other sensory cues is a third approach to home modification to accommodate persons with low vision. Different floor surfaces can offer tactile cues for navigation: for example, tile in the entrance foyer, carpeting in the living room, hardwood in the hall, vinyl in the kitchen, and so forth. Another example of replacing visual cues with tactile ones is sticky-backed felt applied to the smooth surface of a microwave oven's pressure pad: one to each of several frequently used functions, such as *Reheat*, *1 minute*, *Start*, and *Clear*.

Finally, there is the strategy of enhancing color perception. For example, bright, contrasting colors might be used to differentiate walls, floors, and counters. Similarly colors or contrasting patterns might be used to distinguish the *risers* on stairs (the vertical parts) from the *treads* (the horizontal parts).

Sense of Smell

Issues

People who have a diminished sense of smell may have difficulty detecting the presence of odors. Alternatively they may simply not be able to discriminate well among odors.

Implications for Home Activities

Around the home, someone who has difficulty detecting odors may have trouble smelling those that are warnings of danger. Examples are smoke, leaking gas, and airborne pollutants and toxins.

Suggested Modifications

As with hearing and vision, a good strategy of home modification for people who have trouble smelling is to replace one kind of sensory cue with another. Thus, rather than rely on their noses to detect smoke, household members might install an extra smoke and fire alarm that gives auditory or visual signals. They might also install detectors of other hazardous gases, such as liquid propane, used to cook, or methane, used to heat homes. Two gases that may be present in the home, carbon monoxide and radon, are colorless and odorless and thus pose a danger for everyone. Carbon monoxide may be emitted from a leaking furnace flue, radon from the rock and the soil beneath and around the home. Devices exist to detect the presence of both.

Some detectors are available that signal the presence of more than one type of danger—smoke and carbon monoxide, for example.

Sense of Touch and Dexterity

Issues

Problems with the sense of touch may make it difficult for people to discriminate textures and shapes. Their hands, arms or legs may feel numb. People may also have trouble sensing cold or hot surfaces or substances, or sensing pressure or a change in pressure.

Dexterity is the ability to execute fine finger movements—pinching, gripping, turning, twisting, and so forth. It is intimately related to touch. A person may lose dexterity in part because of numbness in the hands and the fingers.

Implications for Home Activities

Around the home, problems with touch and dexterity may result in difficulty adjusting small controls—for example, those on appliances or thermostats. They may also mean trouble gripping, twisting, and turning doorknobs and faucet handles, bottle and jar lids. Locking or unlocking doors and windows (gripping and turning the key or manipulating another type of lock) may become a challenge, as may plugging or unplugging electrical cords, and opening packaged goods. People may unknowingly sustain a burn from a burner or a heating element on the stove, or a cut from a knife or another sharp implement. Further, they may fall because of numbness in the feet. They also risk being scalded at the sink or in the tub or the shower if they have set the temperature on the water heater incorrectly or if the flush of a toilet draws off cold water.

Suggested Modifications

One strategy of home modification for persons with a diminished sense of touch is to heighten the tactile sensation by making the surfaces of walls and counters more distinctive. Brick, vinyl, and wood are among the materials useful for this purpose.

Another approach is to enhance safety. Possibilities in this category are numerous. Lowering the temperature setting on the water heater, a measure that has long been promoted to conserve energy, also lessens the danger of scalding. Installing temperature-limiting mixer valves on existing tubs and showers accomplishes the same purpose. Visual markers may be set on faucets to indicate preset, or desired temperatures. New tubs and showers are available that incorporate pressure-balance valves to compensate for the flush of a toilet or other sudden changes in pressure. Other products that enhance safety are covers for stove burners, guards for radiators, and locks for drawers containing knives and other sharp implements. If dexterity is also an issue, the market offers touchless faucets (activated or deactivated by heat sensors) with preset temperatures.

The strategy of replacing one kind of sensory cue with another works in this realm too. For example, the elements on most electric ranges are of the standard heat-resistant type that grow brighter and redder as the temperature increases. Sighted household members with a diminished sense of touch can thus see that an element is too hot to touch. Some smooth-top ranges pose a particular danger in this regard; elements that are still too hot to touch may no longer be brightly colored. Some ranges offer an "indicator" light which remains on as a warning that a turned off burner may still be too hot to touch. Potential

buyers of such ranges should inquire about their safety features.

For people who have problems with dexterity, controls and handles that do not require pinching or gripping movements can replace ones that do. Thus a handy household member might install levered handles or *C- or D-shaped* loop handles on doors, cabinets, and drawers; levered handles and spray attachments on kitchen and bathroom sinks; light switches with rocker panels, touch pads, or toggles; and push-button combination locks. They might also attach holders to keys, place add-on levers over doorknobs, or replace doorknobs altogether with levers. To make appliance controls more accessible, people can add simple devices to them. In purchasing new appliances, look for those with easy-to-grasp controls.

Strength and Range of Motion

Issues

Reduced strength in the arms and the legs may render people unable to sustain physical effort—to stand for long periods or to carry heavy items even short distances, for example. People who have diminished strength may also have difficulty lifting, pushing, and pulling objects or raising or lowering themselves (say, from a sitting position to a standing position).

Range of motion refers to the scope or the extent of movement possible—how high people can raise their arms above their shoulders or rotate their arms from the shoulders, how far they

can bend their elbows or their knees, and so forth. People with decreased range of motion may have trouble reaching, bending, stooping, kneeling, and crouching.

Implications for Home Activities

Because of the design of most homes, important household tasks like cooking food and washing dishes require standing for long periods. Others require some upper-body strength—among them, making the beds, taking out the trash, and transporting items around the house (e.g., filling a pan with water, carrying it to the stove, conveying it back to the sink, draining the water from it, putting the cooked food in a bowl, and moving the bowl to the table). When strength is an issue, pushing or pulling doors and drawers is a challenge, as is moving heavy items down from high storage areas or up from low storage areas.

Limited range of motion makes some of these same activities difficult—making the beds, for example. It affects performance of other reaching and bending tasks as well—cleaning bathtubs and toilets, for one. Reaching even lightweight items on high shelves or in low storage areas may be a challenge.

Range of motion can also be an issue of a person's height. A short person may not be able to reach high shelves without a ladder or a step stool (and climbing one may be difficult). A tall person may have difficulty reaching into floor-level cabinets and lower shelves.

Suggested Modifications

Some possible modifications enhance existing strength or provide support—for example, a stool to sit on in the kitchen or

in the bathroom, at a cut-out space under a counter or a sink; or a harness to hold a person in a standing position at a sink or a counter. Another example is grab bars in the bathroom.

Other modifications reduce the amount of strength or exertion needed. Included here are some do-it-yourself projects: adjustment of the tension needed to open and close storm and screen doors and some kinds of cabinet doors; purchase of remote controls for lamps, appliances, televisions, and videocassette recorders; and placement of rolling storage carts under counters. A handy household member or a professional can install several helpful products: *C*- or *D*-shaped loop handles on drawers and cabinets; easy-gliding hardware for drawers; a spray attachment at the sink, with an extra-long hose (e.g., to fill pans after they are placed on the stove); a trash compactor to reduce the bulkiness of discarded items and to cut down on the number of trips to the trash bins; and a garbage disposal, again to reduce the number of trips to the trash bins. In more severe cases of diminished strength, people who have trouble getting up from chairs might purchase a *catapult seat*, a device to raise them from a sitting to a standing position.

The main approach to compensate for limited range of motion involves bringing access or controls to people, rather than making people reach for them. One kind of modification in this category is to put the operational components of the home into a zone more accessible to all humans, generously defined as an area 27 to 48 inches above the floor, with a maximum depth of 20 inches. So, for example, switches and thermostats might be placed no higher than 48 inches above the floor, electrical outlets no lower than 27 inches.

Other useful products in this category include a stove or a range with its controls mounted on the front or the side, a side-by-side refrigerator-freezer that is self-defrosting, a front-loading washer and dryer, offset bathtub controls, lazy Susans in corner cabinets and refrigerators, and again, rolling carts for under-the-counter storage. Pull-out shelves with cut-outs to hold bowls offer an easier alternative to accessing a cabinet.

Other kinds of modifications in this category make work and storage space more accessible. Constructing separate work surfaces at different heights accommodates persons within the same household who are of different age or height, or different ability levels. Installing adjustable-height shelves in kitchen cabinets, pantries, and household closets responds to both current and future needs as children grow and adults age. The market offers many products to support more efficient use of cabinets and closets. Vertical strips attached to the walls, with brackets inserted at desired heights, make adjustable shelving possible. Similar products work for sinks and countertops in kitchens and bathrooms. (Making sinks adjustable also requires a flexible water-supply line leading to the faucet and an extra tailpiece, with a slip joint, on the drainpipe.) Mounting blocks with a series of notches permit similar adjustability of rods in closets.

Mobility and Agility

Issues

People with decreased mobility and agility may have difficulty walking or may not be able to walk at all. They may be able to

stand only for short periods or to walk only short distances. They may also have difficulty moving quickly. Some people in this group, wheelchair users among them, may operate controls or perform activities of daily living from a sitting position.

Implications for Home Activities

Around the home, mobility and agility issues may translate into difficulty negotiating long, crooked, inclined, or uneven pathways, and walking up or down stairs. They may also mean trouble carrying items from one place to another and difficulty reaching into floor-level cabinets and upper shelves. Users of wheelchairs and walkers may not be able to negotiate narrow doorways and corridors or thresholds. People with limited mobility and agility may have difficulty getting in and out of bed, on and off the toilet, and in and out of the tub or the shower. Further, they too may be at risk of a scalding at the sink or in the shower when the flush of a toilet draws off cold water—not because they cannot feel the hot water but because they cannot move quickly or without assistance.

Suggested Modifications

One strategy of home modification to promote independent living for people with limited mobility and agility is to eliminate or reduce barriers to easy movement outside and inside the home. An automatic garage-door opener facilitates arrival and departure of household members by car or another kind of vehicle. For the user of a wheelchair or a walker, a ramp or a *berm* (an earthen substitute for a ramp, often more aesthetically pleasing) leading to the entrance to the home eliminates the need to climb or descend steps, as do curb cuts in sidewalks around the home.

Modifications to doors and doorways are possible following the same strategy. One possibility is to reframe doorways to increase the clearance to at least 36 inches so that users of wheelchairs and walkers can pass through unencumbered. When an additional one or two inches of space will provide the needed clearance, another possibility is to replace standard hinges with *swing-clear hinges*. When the swing of a door takes up the maneuvering space that wheelchair users need, an alternative is *pocket doors*, doors that slide back into a pocket created in the wall.

Another modification to doorways is to replace their high thresholds with low, beveled ones or with flooring to create a smooth transition. Dangerous or troublesome level changes are not limited to doorways, of course; they may occur wherever one type of flooring meets another.

A helpful alteration to doors is levered handles, which are easier for everyone to manipulate. Both add-on levers and replacement levers are available. A *C- or D-shaped loop handle* mounted on the pull side of a door, near the hinged edge, helps users of wheelchairs or walkers close doors behind them.

Around doorways and within rooms, users of wheelchairs and walkers need maneuvering space. Family and friends should give some thought to how these people might pass through a given door. This may simply involve moving some pieces of furniture that obstruct passages. Within rooms and halls, high-density, low-pile carpeting makes movement easier for these people by reducing effort and eliminating tripping hazards.

Locating a bathroom and a bedroom on the ground floor offers an alternative to negotiating stairs. This might involve converting a den or a study to a bedroom, and a half bath to an accessible full bath. A more expensive approach is an addition to the house. If these kinds of modifications are not possible, a chairlift or an elevator can be installed to transport the person from one level to another.

Suggested modifications to eliminate barriers in bathrooms include installation of a roll-in or walk-in shower, with a seat, a flexible shower hose, and a hand-held shower head. For a household member with severe limitations, some alternatives for the bathtub are a water-operated hydraulic seat; a portable, hydraulic boom lift; and an overhead track lift. A lift is also useful in the bedroom. Indeed, professionals can craft a track for the lift, to move a person from the bedroom to the bathroom and back.

A related approach in this realm is to enhance safety. For example, soft, nonskid surfaces on bathtub bottoms, shower floors, stair treads, and stair landings minimize the danger of slipping. Treads of a consistent depth, with closed risers of a consistent height, also lessen the hazards of ascending and descending stairs.

Another strategy of home modification for people with limited mobility and agility is to create supports within the home that help with movement or allow resting. Among the most useful items in this category are grab bars and hand rails. Grab bars are particularly helpful in bathrooms as aids to getting in and out of the shower or the tub, and up from or down onto the toilet. Hand rails installed along hallways and on both sides of

stairways can offer significant security to a person whose mobility and agility are limited.

As with people whose strength and range of motion are limited, a useful approach is to bring items to people or to relocate appliances and products. In the kitchen and the bathroom, suggested modifications and products in this category are pop-up appliance holders, pull-out cutting boards and bowl holders, and cut-out, or recessed space beneath countertops, cooktops, and sinks to accommodate a seated person or a person in a wheelchair. Spacer rings and thick seats can raise the height of existing toilets. There are now new toilets with seats 19 inches above the floor.

Balance and Coordination

Issues

Loss of balance and coordination may render people unstable when standing or walking, and thus at risk of falling. Often people whose sense of balance or coordination is diminished will shuffle with the intention of reducing the risk of falling, but will actually increase the risk by doing so. People experiencing changes in this area of function may also have difficulty raising or lowering themselves from chairs, beds, and similar furniture.

Implications for Home Activities

Around the home, issues of balance and coordination may make it difficult for a person to walk without assistance. Beds

may be too high, chairs and toilet seats too low, for people to stand up and sit down easily. There is also a risk of tripping on carpeting, stairs, or thresholds.

Suggested Modifications

Maximizing safety is a key strategy for addressing balance and coordination issues. Lowering or removing thresholds, putting skid-proof rug pads under area rugs, securing the corners and the edges of area rugs, and removing throw or scatter rugs all diminish the risk of tripping. Placing stabilizers—— an extended handrail at the head of the stairs, lessens the chance of an unsteady person falling. Another key strategy is to accommodate people's needs. Lowered beds and raised chairs and toilet seats accomplish this purpose. The optimum height for all three types of furniture differs for each person, but generally it is the height at which the hips and the knees are on the same plane (or the knees are slightly lower) and the feet are approximately under the knees.

Providing supports to stabilize people as they sit down, rise up, and move about is also a good way to address balance and coordination issues. Again grab bars and hand rails are among the most useful items. Placing stable objects near chairs, toilets, and beds is especially important. Strategically placed handles on countertops are also useful.

Enhancing vision by lighting the floors or stairway is also helpful.

Cognition

Issues

Cognition involves a series of steps: detecting the elements of a situation, perceiving their functions, and comprehending the process of which they are a part. As people age, they become more susceptible to diseases such as Alzheimer's that affect cognition.

People whose cognition is diminished may not react quickly to stimuli such as a hot burner or a sharp knife, and may not be able to distinguish or sort competing signals. They may also have difficulty remembering or comprehending information and may process it slowly. Further, time and space may become disoriented for these individuals.

Implications for Home Activities

Around the home, people whose cognition is diminished may not comprehend danger—say, from radiators, sharp knives, open windows, or steep staircases. They may wander away and then not be able to remember important information such as telephone numbers and addresses that would assist them or others in alerting family members or caregivers to their whereabouts.

Suggested Modifications

One strategy for modifying the home of a person whose cognition is diminished is to create safe barriers that will keep the person from wandering away or straying into dangerous areas. Several kinds of barriers are possible, alone or in combination: fences or hedges around the yard, screens on doors and windows, automatic door-closing devices and/or

alarms on doors to the outside, double-key locks, or locks placed beyond the person's reach (high or low). Within the home, family members can take certain measures to ensure that the person does not wander around at night—for example, reverse locks on the bedroom door, bed rails, room-darkening blinds or shades, and a monitor.

Another strategy is to limit access to items that might be dangerous—knives, hot burners, electrical equipment and outlets, and household chemicals and medicines. To guard against injury or misuse, family members might put child-proof plugs in electrical outlets, place guards over radiators, put covers on stove or range burners, and install locks on refrigerator-freezers, medicine cabinets, and closets containing cleaning supplies.

Enhancing cognition is also a way to address issues in this realm. Electric-range elements that grow brighter and redder as the temperature increases, mentioned earlier as an appropriate modification for people who have lost some sense of touch, may also help people whose cognition is diminished.

Conclusion

Whether the home requires simple modifications, or more complex ones, these alterations can allow individuals to remain in the home or families to remain together. If you are planning new construction, universal design elements can be used to make the home more accessible and friendly to all users. When this is not an option, modifications and assistive devices can

bring independence and confidence to the homeowner and family members