

# An American/Korean Older Consumers' Perceptions of Universally Designed Bathing Fixtures

## 유니버설 디자인 된 욕실설비에 대한 미국/한국 노인소비자 견해

Kyung Joo Shin\* Betty Jo White\*\*

### 국 문 요 약

노인소비자들은 나이와 함께 기능적인 능력이 감퇴하면서 주택내의 환경이 그들의 한계와 장애를 보완해 줄 수 있게 좀 더 지원적이기를 기대한다. 이러한 노인그룹을 포함하여 모든 사용자에게 독립적이고, 안전하며, 편리한 생활환경을 조성해 주는 것이 유니버설 디자인이다.

이 연구의 목적은 유니버설 디자인 개념으로 개발 된 혁신적인 욕실용품들, 즉 높이가 조절되어 앉거나 서서 사용하는 장점 등을 갖춘 세면대와, 높이조절이 되는 이동식 샤워기가 장착된 걸어서 들어가며, 접이식 의자가 있는 등의 장점을 가진 욕조에 대한 소비자 의견의 검토이다. 피험자는 미국에 사는 미국노인과 한국노인(50세이상-79세까지)으로 합계 58명이었다. 실험장소는 미국서부 소도시 대학의 유니버설 디자인 연구실로, 이 대학의 협력으로 이곳에 장착된 신개발 설비를 이용하였다. 실험시기는 1997년 5월부터 11월 사이(봄, 가을)로 소비자 의견조사는 3단계로 이루어졌다. 먼저 1단계 설문조사에서는 피험자 거주주택의 욕실환경, 피험자의 목욕방법, 건강과 안전, 새로운 욕실설비에 대한 소비자 의견 등이 조사되었다. 2단계는 실제로 선정 된 욕실설비의 사용실험으로 피험자가 옷 입은 상태에서 목욕을 가정하여 선택된 설비의 사용동작을 하면서(비디오 촬영) 조사자의 조사표에 의한 질문에 답하였다. 3단계는 2단계의 사용실험 후 유니버설 디자인 된 욕실설비의 가정 내 도입의사 등의 조사를 하였다.

위에서 설명한 3단계의 소비자 의견조사 및 실험에서 얻은 결과는 다음과 같았다.

- 1) 미국거주 미국노인과 한국노인의 비교에서는 한국노인의 평균신장이 3cm정도 작았고, 2개이상의 욕실을 가진 비율과 학벌, 독신거주비율은 미국노인이 다소 높았고, 욕조 소유율은 한국노인이 높았다.
- 2) 새로운 욕실 설비에 대한 소비자 의견은 미국과 한국노인 모두 유니버설 디자인된 새 설비의 장점을 인정하였다. 욕조와 세면조가 매력적이라 평하였고 샤워조작기가 색상구분으로 더운물과 찬물인지가 편하며, 접이식 의자가 유용하며, 문 달린 욕조의 안전 손잡이와 욕조가장자리를 잡고 안전하게 출입한다고 했다. 그러나 욕조길이와 높이에서 두 나라간에 차가 있어 앞으로 치수에 대한 것이 연구과제로 지적되었다.
- 3) 욕실 설비 개발 시 유니버설 디자인 용품에 요구되는 목표는 안전하게 쓸 수 있고, 가령에 따른 신체장애요소가 커버되어 스스로 사용가능하고, 사용상 번거로움이 없어 정신적 스트레스를 주지 않는 것이어야 하겠다.

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\* Professor of Consumer, Family & Housing, Hanyang University

\*\* Professor of CTID & Housing, Kansas State University

- 4) 선택된 유니버설 디자인 욕실설비는 표준치수의 현 욕조위치에 장착이 가능하여 앞으로 현 주택에의 교체가 가능하였다.
  - 5) 선택된 유니버설 디자인 욕실설비는 인체치수와 문화가 다른 두 나라 노인 모두 긍정적으로 평가하여 앞으로의 국제적 보급이 기대되었다.
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## I . INTRODUCTION

Despite cultural differences, older adults from both the U. S. and Korea experience similar bathroom use-related difficulties. With normal age-related impairments, personal bathing may require more time and effort. Older bathers can experience stress, fear, and unsafe situations; dependence on assistive devices or other people; and accidents and fatal injuries (Mullick, 1993). The design of household bathing fixtures has remained virtually unchanged since the first bathtub, dating to the Minoan dynasty in 1700 B. C. (Kira, 1966). The slow rate of diffusion of innovations across the fragmented U.S. residential construction industry is well documented (National Association of Home Builders, 1989).

Innovative bathing fixtures now available in the U. S. market, however, can provide greater self-sufficiency and personal safety to older bathers. Research based on Rogers' adoption diffusion theory (1995) suggests that older adults are likely to be among the "early adopters" of universal design features (White, 1998; Sohn, 1997). Products that meet the Principles of Universal Design (Center for Universal Design, 1995) can accommodate most people's needs, regardless of age or ability level. Moreover, the propensity of older people to accept innovations is increased by familiarity with existing technologies

(Moschis, 1994), in this case, bathing fixtures.

The purpose of this study is to examine consumers' responses to universally designed bathroom fixtures such as a sit/stand lavatory sink and side-entry, sit/stand residential bathtub that promote safety, independence and convenience for older people. The research was conducted to compare the similarities and differences of two panels of older Americans and Koreans in bathing procedures and consumers' perceptions of universal design bathing fixtures. The result of the study can be applied to assess the possibility of the introduction of universally designed features and products made in the U.S. to Korea.

## II . LITERATURE REVIEW

The literature review focuses first on the concept of universal design and marketing is also presented, followed by bathing for older people and the theoretical framework for this research: Rogers' theory of diffusion of innovation.

### 1. Universal Design

Universal design, often called life-span design, inclusive design, or transgenerational design, encompasses and goes beyond the accessible, adaptable, and barrier free design concepts of the past. It largely eliminates the need for stigmatizing, embarrassing, different-looking, and usually more expensive special

features and spaces for special people (Covington & Hannah, 1997, p.30). The intent of the universal design concept is to simplify life for everyone by making housing usable by more people at little or no extra cost (U.S. HUD, 1988; Barrier-Free Environments, 1993). Universal design considers human needs and abilities throughout the lifespan. It attempts to meet the needs of people of all ages, sizes, and abilities (U.S. HUD, 1996).

Universal design gives housing providers a new principle to guide their future construction and remodeling activities. They can use this principle to make housing functions and features more attractive to their customers in this market-oriented era. The universal design strategy has great merit in meeting the goals of greater functionality, security, and safety of housing for all household members (Malizia, 1993, p.210).

## 2. Universal Design Definitions.

As the movement toward universal design has grown, the concept has been defined similarly, but with slightly different foci. Mace (1985), who first coined the term universal design, defined it as supportive, adaptable, accessible, and safe.

Behar (1991) prescribed four A's necessary to incorporate universal design into our environment. Accessibility is the knowledge and implementation of accessibility codes to implement ADA legislation. Adaptability is flexible products and designs that work best for all people and maximize their lifespan usage. Affordability means products that protect the client from costly design mistakes. Finally, universal design focuses on function

without compromising Aesthetics.

Wilkoff and Abed (1994) defined two basic characteristics of universal design. First, universal design is not new elements introduced into the environment, but existing ones redesigned to broaden their functionality. Second, universal design creates a safe, more functional, and more convenient environment for everyone, not just those with disabilities.

Null and Cherry (1996) suggested that four principles are essential for creating universal design. Universal design must be supportive, adaptive, accessible, and safe-oriented. Universal design should be supportive, i.e., provide a necessary aid to function and not create an undue burden on any user.

Going beyond definition, Mace and others (1985) developed seven universal design principles: 1) equitable use, 2) flexibility in use, 3) simple/intuitive use, 4) perceptible information, 5) tolerance for error, 6) low physical effort, and 7) size and space for approach and use. These principles were used to aid designers in three ways: 1) the evaluation of designs to determine how universally usable they are; 2) the creation of new designs that are more universally usable; and 3) the education of both designers and consumers.

## 3. Marketing Universal Design.

Advances in technology have helped designers provide universal design features that assist older adults and persons with disabilities and, at the same time, have mass market appeal (AARP, 1996a, p.7). While nursing home residency represents reality for 5% of Americans over 65, the majority of people

over 65 live in private homes and apartments. Making those residences more livable for the aged should be a top priority for today's designers (Godfrey-June, 1992, p.56). The emerging mature consumer market will demand designs that are universal in their approach: beautiful, functional, and enabling independent living (Covington & Hannah, 1997).

Malizia (1993) concluded that universal design features can reduce the long-term costs of housing maintenance and remodeling. As demand for them increases, he suggested that both the design community and its clients will eventually benefit from lower costs and increased affordability.

The first step in marketing universally-designed products and environments is insuring that the term is recognized, accepted, and understood. It is crucial that the population at large not identify universal design with design for special needs (Null & Cherry, 1996, p.251). In addition, to insure that universal design will be accepted, it must have a high aesthetic standards. In fact, the most successful universal designs often express the usability features of the product or environment as strong aesthetic qualities and are successful precisely because they are beautiful as well as useful (Steinfeld, 1996).

Universal design is as much a marketing idea as a design concept since products and spaces that are more universally usable are marketable to nearly everyone (Covington & Hannah, 1997, p.30). Universal and adaptable designs represent what might be called the highest common denominator of housing that offers benefits to the vast majority of

consumers (Malizia, 1993, p.211). Manufacturers have responded to the increased demand for items such as grab bars, hand-held showers, and lever door handles by producing a wide array of styles and colors that will appeal even to those who are unconcerned about universal design (Mace, Hardie & Place, 1990, p.9).

#### 4. Bathing for Older People

While most young, able-bodied people do not think twice about taking bath, bathing is more difficult, more time consuming, and more hazardous for older people with disabilities. For many older people, the point when assistance is needed in the bathroom is critical and often represents a turning point and challenge in terms of the person's outlook (Ahmadi, 1996).

The U.S. National Center for Health Statistics reported that about 10 percent of all people over the age of 65 have difficulty bathing (Lawton 1990). Steinfeld (1993) found that the use of tub was the most common problem among older people.

In America, the risk of bathroom falls threatens older persons' ability to age in place and remain independent despite increasing potential for long-term chronic illness, disability, and dependency. National Safety Council data (1997) show injuries related to bathtubs and showers as fifth most frequent in the home furnishings and fixtures product category. Beginning at age 70, the death rate from falls increases dramatically and at age 79, surpasses the motor vehicle death rate.

In research to develop housing guidelines for older Koreans, Kim (1998) found subjects'

bathrooms be the most frequent source of residential dissatisfaction and the most desired home remodeling project. In observing Korean and Japanese nursing homes, Shin (1995) noted that more than 90 percent of the bathtubs in private rooms were unused because residents had problems stepping over the tub rim.

Of the data available, two characteristics are significant for new or remodeling projects for older people: first, older persons tend to be shorter than young people; second, reach measurements of older people are lower than those of young people (Gregoire, 1993). This is due primarily to arthritis and other joint movement limitations. Elderly people who suffer from arthritis have difficulty with basic movements such as those required for bathing, and those seniors affected with hand tremors are unable to perform the movements necessary to use water controls. In a recent study by Mullick (1996), it was found that the most common problem in bathroom was maintaining balance when bathing. Other problems were largely due to inadequate reach and poor grasp.

Ahmadi (1996) suggested that efforts should be taken to reduce fall risk to minimize both dangers to the individual and financial costs to society. Consideration of ergonomic factors by designers, occupational therapists, and manufacturers of products is critically important if the needs and preferences of this rapidly growing segment of our society are to be met.

## 5. Innovation-Diffusion

The study uses Rogers' innovation-diffusion theory as its theoretical base. Rogers' theory can help predict how potential users' perceptions of the attributes of universal design features influence its adoption.

Diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system (Rogers, 1995, p.5). This study focuses on the attributes of innovations, which are defined as ideas, practices, or objects that are perceived as new to potential users. Rogers identifies five attributes of innovations that affect the rate of diffusion or adoption: 1) relative advantage, 2) compatibility, 3) complexity, 4) trialability, and 5) observability.

Innovation-diffusion theory suggests that an innovation is more likely to be adopted when consumers can see the benefits associated with it, either because one can do something better with it than with existing products (relative advantage) or because it is consistent with existing values, past experiences, and needs of potential adopters (compatibility). In addition, innovations that can be tried in part or whole generally will be adopted more quickly than innovations that can't be "test-driven" (trialability). The personal trying-out of an innovation is a way to give meaning to an innovation, to find out how it works under one's own conditions.

Moschis (1994) used perceived attributes of innovations to help explain the different levels of adoption of various types of technological innovations by older adults. That is, those innovations that provide direct benefits to the older consumer because of their compatibility with existing needs are more readily accepted. Harootyan (1995) also noted that consumers seek out and adopt new technologies based on a combination of factors that include not only need but also the technology's effectiveness, ease of use, integration with one's environment, availability, cost, appearance, and even its

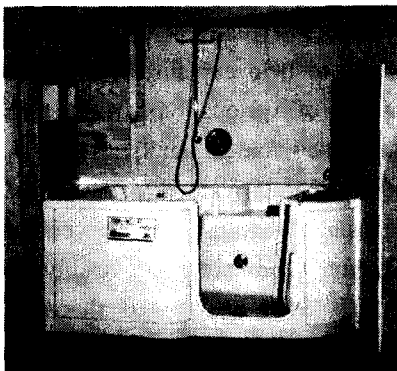
symbolic meaning or acceptability to the user.

### III. METHODOLOGY

As part of the diffusion research program of the Universal Design Facility at a midwestern U. S. university (White & Annis, 1995), the researcher conducted trial interviews with two panels of older Americans and Koreans aged 50 and older. American and Korean consumer panelists tried out a sit/stand lavatory sink, and a side-entry, sit/stand residential bathtub (Figure 1, line drawings<sup>1</sup>).



a. Height-adjustable, sit/stand lavatory sink



b. Side-entry, sit/stand residential bathtub with height-adjustable shower

Figure 1. Bathing fixtures tested by American and Korean panels

The researchers recruited two test panels ( $n=58$ ) of mature (age 50) and older adults through local churches and a Korean grocery store. The traditional Korean bathing method is to wash before entering a deep tub to soak. These Korean subjects, however, had lived in the U. S. at least five years, and at the time of the study were using western bathing fixtures.

The data were collected from pre-trial survey and user-simulation of an innovative bathing fixtures. Pre-trial survey question investigated features of the subjects' home bathrooms, personal bathing procedures, health and safety concerns, and consumers' perceptions of the universal design bathing fixtures. Following a self-administrated pre-trial survey, each panelist performed user-simulation of both fixtures (fully clothed but barefoot and without water) while responding to open-ended interview questions in a discussion-like situation. Consumers' trials were all video-taped. After trying both bathing fixtures, each panelist was asked the willingness to adopt innovative bathing fixtures.

The data were collected in English from the Americans and in Hangul from the Koreans. The researchers compared the survey descriptive data and content-analyzed the interview results relative to the subjects' home bathing methods, their safety and health issues, and their responses to the innovative products<sup>2</sup>.

### IV. RESULTS AND DISCUSSION

The results are summarized as follows: sample descriptions, bathing facilities and procedures, health and safety concerns, and consumer perceptions of the innovative

bathing products. As appropriate, a table and bar graphs illustrate the cross-cultural comparisons. Given the small sample sizes, the narrative results include the high frequency percentages and respectiveness, while the table and bar graphs use relative proportions.

### 1. Sample Descriptions

Comparisons of the two samples' demographic and housing characteristics are shown on **Table 1**. Both nonrandom samples (n=29 each) were predominantly female, with three males in each group. Mean ages were 67.2 for the Americans and 62 for the Koreans. At age 50, the youngest panelists were early U. S. Baby Boomers or Koreans born before war devastated their country in 1950. The oldest American subject was 85 years old, compared to the oldest Korean at age 76. Life expectancies for the two cultures are 76 years for the U. S. (National Center for Health Statistics, 1994), and 73 years in Korea (National Statistics Office, 1994).

The mean height of the U. S. subjects was 64.5 inches (163.8 cm), compared to the Koreans at 61 inches (154.9 cm). In both cultures, the average height of older people (women, in particular) is a few inches shorter than young people (Diffrient, Tilley & Harman, 1981). Within a wide range of educational levels, nearly one-half (14) of the American panelists were high school graduates or had some post-secondary training. Among the Korean group, although three-fourths (22) had not completed high school, five (17.2%) were high school graduates, and two (6.9%) had bachelor's degrees.

More than two-thirds (19) of the Americans

and over one-third (10) of the Koreans lived with their spouse. The remaining one-third (9) of the U. S. panelists and five (17.2%) Koreans lived alone. Nearly one-half (14 or 48.2%) of the Korean sample lived with one or more adult children, unrelated persons, or in an extended family.

**Table 1. Sample Characteristics (n=58)**

Variable	American n = 29		Korean n = 29	
<b>Demographic Characteristics</b>				
<u>Subject Age(in years)</u>				
Range	50-85		50-76	
Mean	67.2		62	
<u>Subject Height(in inches)</u>				
Range	59-72		58-66.7	
Mean	64.5		61.0	
<u>Educational Level</u>				
Less than high school	1	3.4	22	75.9
High school graduate	7	24.1	5	17.2
Some college/vocational training	7	24.1	0	0.0
Bachelor's degree	8	27.6	2	6.9
Graduate work or degree	6	20.7	0	0.0
<u>Living Arrangements</u>				
With spouse	19	65.5	10	34.5
Alone	9	31.0	5	17.2
With 1+adult children	1	3.4	5	17.2
With 1+unrelated persons	0	0.0	6	20.7
Extended family	0	0.0	3	10.3
<b>Housing characteristics</b>				
<u>Housing Type</u>				
Single-family	23	79.9	28	96.6
Townhouse	2	6.9	1	3.4
Manufactured home	2	6.9	0	0.0
Apartment	1	3.4	0	0.0
Assisted living	1	3.4	0	0.0
<u>Number of Bathrooms</u>				
Two and one-half or more	11	37.9	2	6.9
Two	11	37.9	11	37.9
One and one-half	4	13.8	3	10.3
One	3	10.3	10	34.5
No response	0	0.0	3	10.3

<sup>a</sup> Totals may exceed 100% due to rounding.

<sup>b</sup> Respondents could select more than one choice.

Over three-fourths of the subjects in both samples lived in single-family homes, but 20 percent of the U. S. subjects lived in townhouses, manufactured homes, an apartment, and an assisted living facility. Over three-fourths (22) of the Americans and nearly one-half (13) of the Koreans reported two or more bathrooms in their homes.

## 2. Bathroom Facilities and Bathing Behaviors

Characteristics of the two groups' bathroom facilities are compared in Figure 2. Lavatory sinks with vanity cabinets were most frequent (76% of the Koreans and 69% of the Americans) in the bathrooms where the subjects usually bathed. Almost 83 percent of the Koreans reported a bathtub/shower combination, compared to 41.4 percent of the Americans. The remainder of the U. S. sample reported a shower stall only (11) or a bathtub with no shower (8). More Koreans (8) than Americans (6) cited hand-held showers. Adjustable-height showerheads, shower stalls with seats, portable tub seats, and sinks with knee space were rare in the homes of the subjects.

From bathroom safety features listed (Figure 3), two-thirds or more of each panel cited adequate lighting in tub/shower (20 American, 19 Korean), followed by nonslip tub/shower surface (13 Americans, 7 Koreans). Frequencies for the remaining safety features differed between the panels. Nine Americans (31%) cited nonslip floor surfaces, and seven each indicated easy-to-see tub/shower controls and bathtub grab bars. Four Koreans reported grab bars in the bathtub. Shower and toilet grab bars as well as telephones or emergency call

buttons were cited infrequently by either group.

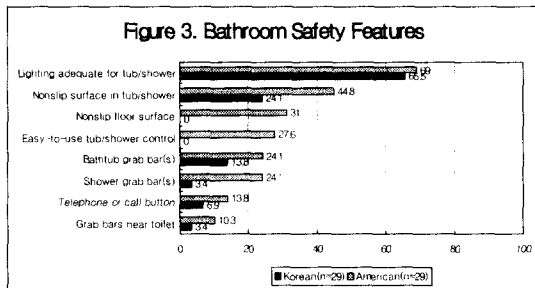
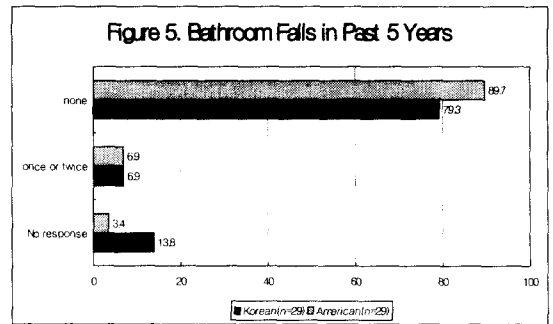
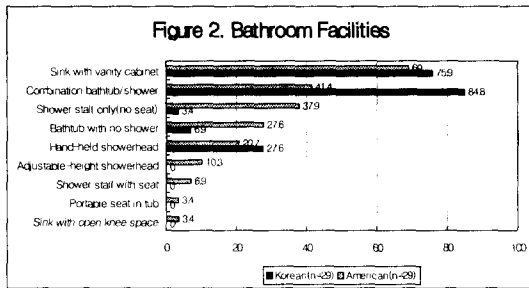
The majority of each sample bathed once a day (17 Americans, 16 Koreans), plus two Koreans who bathed twice daily. Over one-third (10) of the Koreans and nearly one-fourth (7) of the Americans reported taking three or four baths per week. Four in the U. S. group bathed one or two times per week, some of whom noted that fragile skin conditions limited their bathing frequency.

Showering in the tub or a separate stall was the usual bathing method in almost two-thirds or more both samples. The total number of Koreans who reported showering in the tub or shower was 21 (72.4%), compared to a total of 18 (62.1%) Americans. Over one-third (10) of the U. S. group and over one-fourth (8) of the Korean sample usually bathed in the tub, often the oldest members within each sample.

Other than cleansing, almost two-thirds (18) of the Americans and over one-half (16) of the Koreans cited relaxation as the most important reason to bathe. Well over one-third (11) of the Koreans and one-fifth (6) of the Americans, however, reported "to decrease aches and pains" as their other most important reason. The researchers assume that the relatively high levels of Not Applicable and nonresponses indicate that those subjects usually showered.

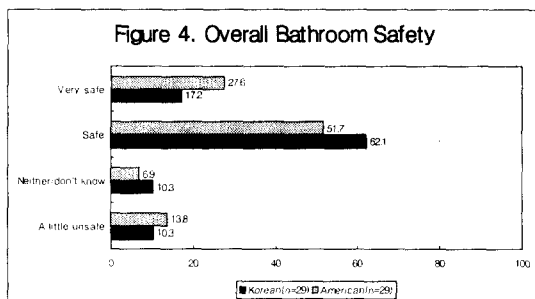
Asked how frequently they shampooed their hair, 25 (86.2%) Koreans shampooed every day or three or four times per week, compared to less than one-half (14) of the Americans. Nearly one-fourth (7) of the U. S. subjects washed their heads one or two times per week. The remainder of both samples (8 Americans and 4 Koreans) used hairdressers rather than shampooing at home.





### 3. Health and Safety Concerns

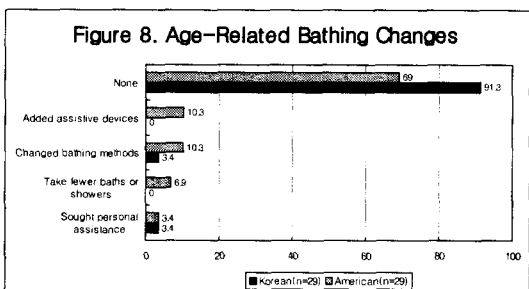
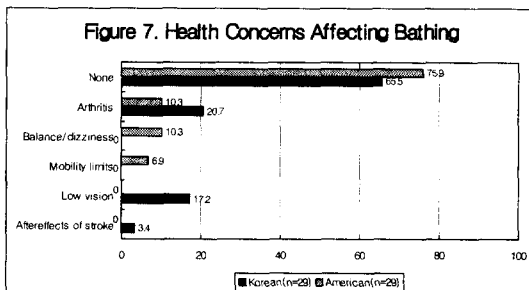
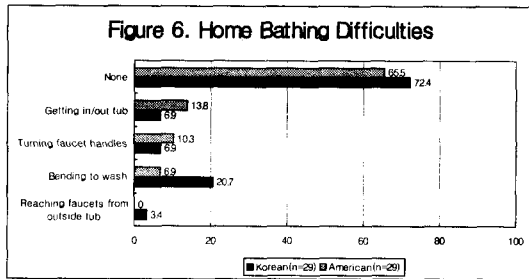
The pre-trial survey also raised bathroom question about the subjects' health conditions and home bathing safety (Figures 4, 5). Over three-fourths (23) of each panel rated their bathrooms as safe or very safe. But four Americans (13.8%) and three Koreans (10.3%) indicated that their bathrooms were "a little unsafe." Ninety percent (26) of the Americans and almost 80 percent (23) of the Koreans reported no bathroom falls in the past five years. From each group, two persons reported falling once or twice during that period.



Asked to select from four possible bathing difficulties, almost three-fourths (21) of the Koreans and over two-thirds (19) of the Americans stated, "none" (Figure 6). Among the remainder, the difficulty reported most frequently (5) by the Korean group was bending to wash. Three Americans each cited problems in getting in/out of the tub and in turning faucet handles.

More than three-fourths (22) of the Americans and two-thirds (19) of the Koreans reported no health concerns that affected their bathing (Figure 7). Among seven conditions listed, more than 20 percent (6) of the Koreans and 10 percent (3) of the American sample cited arthritis. Three more Americans reported balance/dizziness problems. The Koreans' second most frequent concern was low vision (5). The only other concerns reported by either sample were mobility limits and after-effects of a stroke.

Asked about making age-related bathing changes, 90 percent (26) of the Koreans and over two-thirds (20) of the Americans reported, "none" (Figure 8). Three each of the U. S. subjects had added assistive devices or changed their bathing methods, while two reported taking fewer baths or showers. One subject from each culture had sought personal assistance for bathing.



#### 4. Consumer Perceptions

The researchers ranked the results of the consumer trial interviews (largely open-ended questions) by frequency order. Presented below are the most frequent positive and negative responses plus differences between the two samples.

##### 1) Height-adjustable, wheelchair accessible lavatory sink.

Both consumer panels were unanimous in rating the overhang lavatory sink (installed in

a height-adjustable countertop) as sleek and attractive. The two groups also responded positively to the choice of sitting to sponge bathe or wash hair, and the ability to accommodate standing users of various heights at the push of a button. Third in rank order, both samples also appreciated the sink's overhang and wide width (to bring the faucet closer to the seated user and to catch drips from arms and elbows).

The only potential drawback expressed by panelists from both cultures was that the height-adjustability controls for the lavatory countertop could be an attractive nuisance for grandchildren. Furthermore, several subjects inadvertently leaned on either the Up or Down button, receiving an instant height-change response. They recommended moving the control buttons from the front of the countertop to the side.

Panelists' perceptions of the sink depth differed between the two samples. The vast majority of Americans and over one-half of the Koreans considered the sink depth adequate, although somewhat shallow in front. More Koreans than Americans, however, commented favorably about the side rear location of the drain. Several Americans were unaware of the rationale for locating the drain away from a seated user's knees. In the Korean panel, over two-thirds stated a need for knee space below the sink, while the remainder preferred shallow storage shelves. The Americans' opinions were split, favoring a vanity cabinet slightly over knee space.

##### 2) Side-entry bathtub.

Almost all subjects from both cultures

agreed that the side-entry bathtub was attractive and non-institutional in appearance. Second most frequently, both groups responded positively to the choice of (or need for) bathing from a seat, and the easy-access, walk-in entry. The majority of the Americans' first words about the tub were, "Will the door leak?"

Third in frequency order, both test panels endorsed the locations and heights of the fold-down seat/backrest and the built-in grab bar. Subjects noted that the seat was comfortable, and when folded up, allowed them to stretch their legs. Panelists from both cultures viewed the integral grab bar as an aid in rising from the seat, sitting down, or maintaining balance while standing.

The potential drawback noted by the majority of subjects in both samples was that the tub's built-in grab bar might not be sufficient<sup>3)</sup> Most often, they recommended a second grab bar located on the outside rim of the tub to the left of the door. Several Korean and American consumers noted that two hands were needed to release the seat's anti-flotation catch (when dry). Another concern noted by subjects from both cultures was that the tub seemed narrow, a perception possibly intensified by the 24-inch high side walls that permit a deep soak or whirlpool use.

Relative to differences in the two groups' tub trial results, a slightly larger proportion of Korean than American panelists responded favorably to the tub's slip-resistant floor and seat surfaces (which also serve to reduce glare, a low vision concern of older adults). Several Americans qualified their positive responses by noting that the smooth surfaces

of the side ledge, armrests, and outside rim could become very slippery when wet. Both groups perceived the combination armrests/ eat supports as very comfortable and useful in rising from the tub floor.

Anthropometric, cultural, and gender differences may explain divergent perceptions between the two samples about the seat height and tub length. Some Americans cautioned that the seat was too low for tall people and for knee and hip surgery patients, while a few Koreans indicated that the seat was too high. Within these predominantly female samples, most Koreans and two-thirds of the Americans considered the tub long enough to extend their legs full length.

Consistent with their traditional bathe-then-soak procedures, most of the Koreans responded positively to the tub's whirlpool and deep-soak features. Conversely, nearly two-thirds of the Americans usually showered (quickly), and most had never used a whirlpool bath except in a hotel. Another result of these gender-biased samples was that the women were more likely than their male cohorts to soak for relaxation.

### 3) Tub/shower controls.

The easy-to-see, color-coded on/off temperature control received the highest number of positive responses from both panels. Second in rank order, both groups also favored its lever handle--most subjects noting the ease of use with only one hand. Several Americans commented, how-ever, that the lever handle was somewhat short and sharp-edged on the back.

More American than Korean panelists favored the central back wall location of both

the shower/slide bar and its controls. Although available with the drain on either the right or left side, the bathtub used in the trials drained to the right. Several subjects from both groups concluded that as such, the hand-held shower was "left-handed." For stroke patients with hemiplegia, specification of their "best" side could mean the difference between usability or abandonment of the fixture.

#### 4) Height-adjustable, hand-held shower.

Positive responses to the choice of eternal and stronger slide bar installed with the same wall reinforcement used for bathroom grab bars. Furthermore, ADA no longer permits knobs that must be tightened (vs. friction-held) to secure the showerhead at a given height on the slide bar<sup>4)</sup>.

The greatest difference between the two panels' responses to the shower centered on the importance of height adjustability. While most of the Koreans noted a need for shower height-adjustability, several Americans (accustomed to a fixed showerhead) reported little need to change its height. A few also noted that the 24-inch long slide bar was too short to meet the 6-foot shower height required by U. S. building codes and within a comfortable, safe reach from the fold-down seat. Longer and stronger slide bars are becoming more available in the U. S.

## V. CONCLUSIONS AND IMPLICATIONS

In these consumer product trials, older American and Korean subjects rated both of the innovative bathing fixtures as attractive and noninstitutional in appearance. Both

fixtures also offer the choice of standing or sitting and are barrier-free (e.g., under-sink kneespace and walk-in tub). The majority of both panels responded positively to the color-coded shower control and its lever handle. Finally, their most frequent consumer concerns centered on raising the tub seat, only one tub grab bar, using the shower slide bar as a grab bar, and the lavatory countertop's "too-easily" accessible controls.

Perceptual differences between these two consumer groups focussed on tub length and seat height, shower height adjustability, whirlpool use, lavatory sink depth, and the question of knee space under the sink. The tub length and height issues may be attributable to anthropometric differences between the two cultures. The other items may result from culture-specific differences in bathing practices and fixtures.

The consumer trials were effective in introducing innovative bathing products to older adults--even without water or personal privacy. Although the reader is cautioned against generalizing from these nonrandom samples (in particular, to older Koreans who live in Korea), the results do suggest several avenues for user-oriented studies using experimental control groups and both self-reported and observational performance data.

Based on these results, the researchers drew three conclusions from the results of this qualitative study:

1. The major relative advantage of this sit-stand lavatory sink and bathtub/shower is the integration of universal design features into products that can replace standard residential-size fixtures. The

demand thus may increase exponentially beyond new homes for upscale, sybaritic bathers to the rising numbers of mature and older people planning residential modifications for aging in place.

2. Marketing plans that capitalize on these fixtures' noninstitutional appearance, simple and intuitive use, and adaptability may speed worldwide diffusion in developed countries--despite anthropometric differences and culture-specific bathing practices. While very aware of their potential for falls, persons within the rapidly increasing older population seem largely unaware of these products' existence.
3. To achieve the increasingly universal goal of bathing safely and independently despite normal age-related limitations, bathing products' designers may need to modify their products to enhance feelings of (nonslip) security, minimize user strength requirements, and prevent overexertion among frail bathers.

Specific questions arising from these findings suggest development of hypotheses for further study. Longitudinal and gender-specific residential use data from frail older adults can allay bathtub/shower use safety concerns. Other older user-focused tub/ shower research might address left- vs. right-handed or even either-handed shower controls; the extent or locations of slip-resistant surfaces; the number, placement, and reinforcement of shower slide bars and grab bars; and the strength required to raise a fold-down seat or operate the door. For sit/stand lavatory sinks, researchers could focus on height-adjustment controls as attractive nuisances and the

dilemma between open knee space and the aesthetic and storage benefits of vanity cabinets.

The implications of these findings for increasing and marketing the relative advantages of innovative bathing fixtures are many. First, the manufacturer's tub door warranty may need to be highlighted (e.g., sticker on the door) for consumers who are too shy to ask about leaks. Similarly, high volume tub drains may need to provide assurance to older users and their caregivers that a chill won't be the aftermath of this bath. For all bathing innovations, the ability to accommodate people of all ages and capabilities without "special" or age-specific features or an institutional look seems the key to successful marketing.

Finally, this study's delimitations excluded two factors important to broader diffusion and increased adoption rates for bathing fixtures that accommodate aging in place. Researchers, designers, and manufacturers must continue to resolve product cost issues, including the use of alternative/assistive bathing devices.

## NOTES

- 1) The sit-stand, accessible sink is somewhat wider side-to-side, shallower, and extends beyond the front of a standard countertop that is height-adjustable at the touch of a button. Its single-lever faucet has a retractable hand-held spray. The bathtub is standard 60-inch length but eight inches wider than the typical 30-inch American tub. While the step-in side entry, folding seat, and height-adjustable shower accommodate

- various limitations, the tub is not wheelchair accessible.
- 2) Based on previous universal design diffusion research in which subjects' responses to product prices confounded other findings, this study excluded prices. The researchers did, however, provide subjects with cost information after the product trials.
  - 3) Although the manufacturer recommends installation of an additional grab bar, the second bar was omitted for these product trials to elicit consumer responses about the "best" location for another grab bar.
  - 4) Although ADA covers public accommodations and commercial facilities rather than single-family residences, its shower/bath requirements have begun to influence the design and construction of new housing units.
5. Center for Universal Design. 1995. The principles of Universal Design (Version 1.1). Raleigh, NC: Author.
  6. Covington, G. A., & Hannah, B. 1997. Access by Design. New York: Van Nostrand Reinhold.
  7. Diffrient, N., Tilley, A. R. & Harman, D. 1981. Humanscale 4/5/6. Cambridge, MA : Massachusetts Institute of Technology (MIT) Press.
  8. Godfrey-June, J. 1992. What Do The Aging Want? Contract Design, 34(3), 55-57.
  9. Gregoire, R. G. 1993. Design considerations for the elderly. Building Design, 45-47.
  10. Harootyan, R. A. 1995. The House We'll Live In: Accessibility and Adaptability. Ageing International, 22(1), 47-53.
  11. Kim, T. I. 1998. A study on development of housing design guide for the elderly: Predictions of accidents and examination of living conditions at home, The Journal of Korean Architectural Institute 14(2): 23-34.
  12. Korean National Statistics Office. 1994. Title to be found ASAP.
  13. Lawton, M. 1990. Aging and Performance of Home Tasks. Journal of the Human Factors Society, 32(5), 527-536.
  14. Mace, R. L. 1985. Universal Design: Barrier- Free Environments for Everyone. Designers West, 33(2), 147-152.
  15. Mace, R. L., Hardie, G. J., & Place, J. P. 1990. Accessible Environments: Toward Universal Design. Raleigh: Center for Accessible Housing.
  16. Malizia, E. E. 1993. Marketing Accessible Housing: A New Approach. Journal of Housing, 50(5), 205-211.
  17. Moschis, G. P. 1994. Marketing strategies for the mature market. Westport, CT Quorum Books.
  18. Mullick, A. 1993. Bathing for older people with disabilities. Technology and Disability 2(4):19-29.

## REFERENCES

1. Ahmadi, R. 1996. Ergonomic Factors in Designing a Bathroom for Seniors. Seniors' Housing Update, 7(1).
2. American Association of Retired Persons (AARP). 1996a. Focus on Accessible Housing, Home Modification, and Universal Design. AARP Housing Report(Pub. No. PF 5266/6(996)). Washington, D.C.: Consumer Affairs.
3. Barrier Free Environment, Inc. 1993. UFAS Retrofit Guide: Accessibility Modifications for Existing Buildings. New York: Van Nostrand Reinhold.
4. Behar, S. 1991. A Design Solution for Aging In Place. The ASID Report, 6-9.

19. Mullick, A. 1996. Bathing for older people with disabilities. IDEA Publication: State University of New York at Buffalo.
20. National Association of Home Builders Research Foundation. 1989. Diffusion of innovation in the housing industry. Upper Marlboro, MD: Author.
21. National Center for Health Statistics. 1994. Health, United States, 1993 (PHS 94-1232). Hyattsville, MD: U. S. Department of Health and Human Services.
22. National Safety Council. 1997. Accident facts. Chicago: Author.
23. Null, R. L., & Cherry, K. F. 1996. Universal Design: Creative Solutions for ADA Compliance. California: Professional Publications, Inc.
24. Okuyama, K., Aono, K., Nakashima, R., Yamaguchi, M. & Kikuzawa, Y. 1997.
25. Sanitary spaces in the "Silver Housing" for the elderly, Research Journal of Living Science 44(1):18-32.
26. Peterson, M. J. 1996. Universal bathroom planning. Hackettstown, NJ: National Kitchen and Bath Association.
27. Rogers, E. M. 1995. Diffusion of Innovations (4th ed.). New York: Free Press.
28. Shin, K. J. 1995. The condition and the analysis of the problems of the Japanese elderly home: Equipment and expenditures, Journal of the Architectural Institute of Korea 10(11):123-132.
29. Sohn, J. H. 1997. Older consumers' pre- and post-trial perceptions of residential universal design features. Unpublished Masters' thesis. Kansas State University.
30. Steinfeld, E. 1996. Universal design as innovation. Buffalo: State University of New York at Buffalo, Center for Inclusive Design and Environmental Accessibility.
31. Steinfeld, E. 1994. The Concept of Universal Design. The Sixth Ibero-American Conference on Accessibility. Rio De Janeiro: Center for Independent Living. Available WWW: Hostname: arch.buffalo. edu Directory: ~idea/publications/papers File: concept\_uni\_des. html.
32. U. S. Department of Justice. 1998. Revised Americans with Disabilities Act Accessibility Guidelines. Washington, DC: U. S. Govt. Printing Office.
33. U.S. Department of Housing and Urban Development. 1988. Universal Design: Housing for the Lifespan of All People. HUD 1156-PDR, Washington, D.C.: Author.
34. U.S. Department of Housing and Urban Development. 1996. Residential Remodeling and Universal Design. HUD 1604-PDR, Washington, D.C.: Author.
35. White, B. J. June 1998. Lessons learned from diffusion research on residential universal design features. Proceedings: Design for the 21st Century International Universal Design Conference. Hempstead, NY: Hofstra University, pp. 172-179.
36. White, B. J. & Annis, P. 1995. Universal design facility: State of the art teaching tool, Housing and Society 22(1/2):29-37.
37. Wilkoff, L. W., & Abed, L. W. 1994. Practicing Universal Design: An Interpretation of the ADA. New York: Van Nostrand Reinhold.