The role of technology for healthy aging among Korean and Hispanic women in the United States: A pilot study

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C.D. Steggell, K. Hooker, S. Bowman, S. Choun, S-J. Kim. The role of technology for healthy aging among Korean and Hispanic women in the United States: A pilot study. Gerontechnology 2010; 9(4):433-449 doi:10.4017/gt.2010.09.04.007.00 As a result of increasing life expectancies, declining birth rates, and an increasing number of ethnic minorities among the general USA population, a growing number of minority older adults will potentially need assistance as they age. The purpose of this study was to investigate the interests and concerns of USA Korean and Hispanic minority older women regarding the application of communication and monitoring technology to support aging in place to gain insight into some of the unique issues of these populations. This study was guided by a conceptual model of the use of gerontechnology that integrates the Life-span Theory of Control and a congruence model of person and environment interaction. Focus groups in the participants' native language were used to explore attitudes and values of immigrant Korean (n=19) and Hispanic (n=13) older women. Focus group discussions were stimulated by four videotaped vignettes showing different assistive technolog ies being used by an older adult in her home. Content analysis of qualitative data revealed emergent positive themes, which included the participants' willingness to try gerontechnologies, an appreciation of the potential for improving connections to family members still in the home country, and recognition of the improved safety and independence that technologies may provide. Negative themes included financial concerns, language barriers for usability, and concerns about possible physical effects of electronics. The perceptions of gerontechnologies among the minority women in this study reflected Korean and Hispanic cultural experiences and values. As gerontechnology research moves forward, it will be important to consider cultural dynamics of minority groups in the design, selection, and use of any new tool.

Keywords: USA immigrant, gerontechnology, minority, acceptance, perception

In the USA, older adults almost uniformly prefer to age in place[1]. This choice has psychological and financial consequences. For many, particularly those living alone, aging in place requires substantive social and physical support. Technological advances have great potential to extend the time elders can remain in their own homes, en-

hance quality of life, alleviate the pressures on caregivers, and reduce the demands on the health care system[2].

Research reveals unique perceptions and usage patterns of technology by older persons compared to younger people[3]. Although a broad array of technology is now available that may offer extended independence in aging, little is known about possible ramifications in supporting aging in place. Industry recognition of the importance of understanding users' perceptions and preferences is strong since barriers to acceptance of technology from the perspective of the aging population could affect potential users' motivation or willingness to use a technology, their ability to use it effectively, and to be satisfied with the results[2,4].

Research focused on the use, acceptance, and satisfaction of innovative technologies that may enhance living for older adults is crucial[5] and benefits from cross-collaboration of social scientists and technology developers[6]. Luborsky[7] stressed the importance of understanding social, cultural, and ethical differences in understanding technology usage by seniors and pointed out that culture and personal biography shape the course of technology acceptance at the individual level. However, not all effects of the introduction of a new technology are likely to be planned or even anticipated when the technology is designed. Unintended consequences may lead to an entirely different pattern than those discovered for more conventional devices[8] or even from the same device in the hands of diverse individuals.

As a result of increasing life expectancies, declining birth rates, and an increasing number of ethnic minorities among the general USA population[9], a growing number of minority older adults will potentially need assistance as they age. In particular, a significant increase in the number of Mexican American older persons is expected in the next few decades. Already there are 37.4 million Hispanics in the USA, representing 13.3% of the total population. Of those, nearly 2/3 (66.9%) are of Mexican origin and over 40% were foreign born[10].

Korean elderly in the USA are also rapidly increasing in numbers. As a result of recent immigration by elders joining their children and the aging of an earlier cohort of immigrants[11], Korean Americans now comprise approximately 10.5% of the USA Asian population and 0.4% of the total USA population[12, 13].

Minority women have a shorter lifespan, on average, than European American women. This is due in part to a greater incidence of chronic diseases[14]. Barriers to accessing formal support services together with a strong tradition of extended interdependent families combine to place an intensive caregiving role on family members. These traditions may have important implications in the adoption of technologies that may relieve some of the stresses associated with caregiving burden.

The application of technologies to aging in place must be determined with knowledge of cultural issues and individual preferences. Individuals may be required to adapt to new technologies while simultaneously coping with changes in physical, social, and cognitive resources. In order to best use technologies to support aging in place, it is essential to understand elders' skills, attitudes, and preferences.

The purpose of this study was to investigate the interests and concerns of USA minority elder women regarding the application of technology to support aging in place through a sample of Hispanic and Korean older women living in Oregon. Cultural norms, language barriers, and physical isolation may relate to technology use[15]. Thus, it is important to investigate the perceptions of different cultural groups as we build a foundation of understanding the issues and move toward helping people choose the technologies that will best fit their lives.

Conceptual framework

This study was guided by a conceptual model of the use of gerontechnology that integrates the Life-span Theory of Control[16,17] and a congruence model of person and environment interaction[18]. According to the Life-span Theory of Control, optimal development is dependent on an individual's degree of control throughout the life-span. Motivation for control influences selection, compensation, and person-environment interactions. For example, an individual with high motivation for control will select appropriate goals and, in the case of failure with interactions with environments, will find ways to compensate in order to continue pursuing those goals. The use of gerontechnology can be seen as both selection and compensation mechanisms.

The congruence model of person and environment (P-E) interaction[18] argues that human behaviors are an outcome of the interplay between an individual's needs and

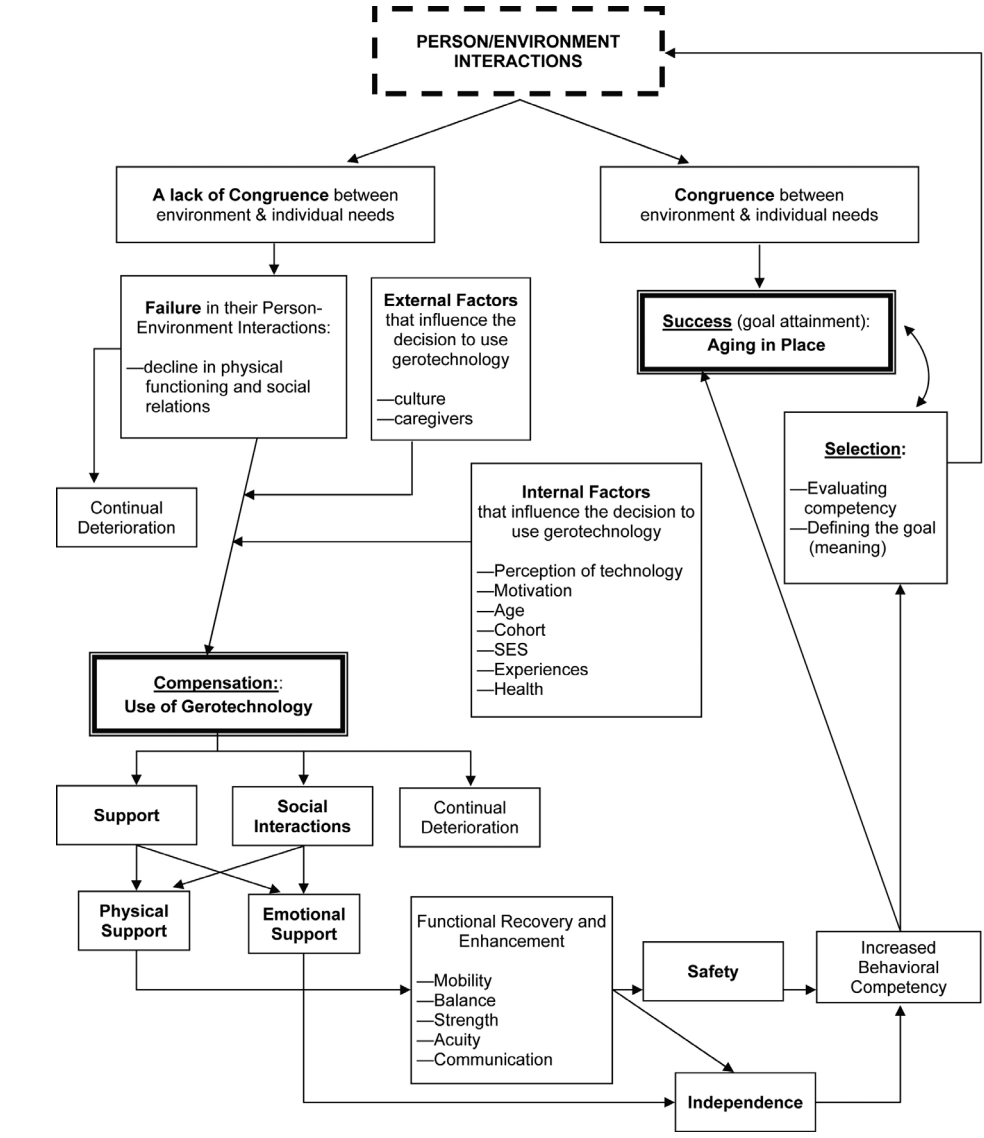

Figure 1. Conceptual model of use of gerontechnology integrating Life-span Theory of Control and Congruence Model of Person and Environment Interaction[19]; Reprinted by permission

environmental demands. Congruence between the individual and the environment is necessary to foster independence and facilitate aging in place. At the same time, the environment must press slightly above the adaptation level to provide stimulation. This framework suggests that individuals may be willing to change their environments in order to improve their level of competence. In this model, gerontechnologies can contribute to an appropriate level of environmental press, resulting in optimal P-E congruence.

An integration of the Life-span Theory of Control and the congruence model of person and environment interaction was proposed by Mahmood et al.[19] to incorporate the role of gerontechnology for aging in place. The integrated conceptual model (*Figure 1*) provides a holistic perspective of the P-E interaction as mediated by gerontechnology and clarifies the decision making process involved in its selection and use. Although not yet validated in other studies, the model provides a useful visual representation of the relationships among several key concepts: P-E interactions, compensation, and selection. For individuals experiencing deficiencies caused by declining health, the model provides a possible path for successful aging.

Literature review

Gerontechnology and minorities

In the USA, the percentage of adults over the age of 65 who use the internet is lower than in younger cohorts (22% as compared to 77% of 18-29 year olds), but the numbers are growing rapidly. 'Wired seniors' are predominantly white and well-educated with higher than average incomes, and about 60% are male. Younger English-speaking Hispanics are less likely to be wired than non-Hispanic whites, but among those over 65, internet use is about the same (21%) as for white seniors[20].

In 2003, a workshop on Technology for Adaptive Aging was held under the sponsorship of the USA National Institute on Aging Office of Behavioral and Social Research. Researchers who participated in the conference stressed the imperative to consider different cultural contexts in the design and marketing of technologies[6]. Others (e.g. Gitlin[21]) have reported that sociocultural context impacts the willingness of individuals to use assistive technology. Nevertheless, there is a dearth of studies focused specifically on the acceptance and usability of gerontechnologies among minority elders.

Racial and ethnic disparities in health status and health care are well established[22]. However, very little research has focused on implications of these disparities on gerontechnology. In a study of racial and ethnic disparities in mobility device use in later life, Cornman and Freedman[23] suggested that, while differences in the rate of use of mobility devices among ethnic minorities may be related to difference in the propensity to substitute devices for personal care, minorities actually use mobility devices in proportion to the underlying need. Similarly, a study of minority elders' receptivity to telecare technology[24] suggests that health technologies, with the exception of camera-related monitoring, is acceptable in a wide variety of situations. Acceptance increased with education level, IADL need level, and age. This suggests that other technologies may be accepted when there is a good match between need and the technology in question.

User acceptance of gerontechnology is dependent upon the needs of the users. Those with greater needs may have more desire to implement the technology[25, 26]. However, perception of need is subjective, and elders sometimes resist utilizing assistance of any kind[27]. In recommending the adoption of any technology, the technology must be 'designed specifically to meet the needs, capabilities, limitations, and preferences of older adults'[28p39]. As preferences are highly influenced by culture and experience, it is essential to be mindful of the diversity of preferences among people of various cultures.

Korean elders

The aging of Korean immigrants has contributed to a large increase in the numbers of Korean older adults in the USA[12].The vast majority (95%) of older Korean Americans are Korean-born and tend to adhere strongly to Korean traditional cultural beliefs and values. Further, although Korean Americans as a whole have one of the highest levels of education, Korean immigrant elders have significantly lower educational attainment. Particularly for those who arrived in the USA late in life, often at the invitation of their adult children already in the USA, older Korean immigrants may experience acculturative stress[29,30]. Low education, low English proficiency, and poor understanding of American customs may contribute to difficulties in adjusting to American society. Thus, Korean older persons may feel acutely dependent on their families for various support needs[31].

In order to examine experiences and family relationships of older Korean Americans, it is important to understand the Korean cultural value of filial piety, and the traditional hierarchical and patriarchal family structure[32]. Older Korean immigrants may have significant conflicts in their personal relationships, as multi-generational families seek to reconcile divergent Korean and American cultures[33,34].

In Korea, about 65% of the older persons live with their adult children, usually with the eldest married son[35]. However, evidence suggests that Korean Americans are no longer willing to practice filial piety in the traditional sense, nor do most of their parents expect their children to do so. Consequently, the majority of Korean American elders live alone or with a spouse only[12]. Still, adult children remain the most important source of help for Korean American elders[35].

At the community level, Korean churches in the USA are the most significant community resource for Korean immigrants and are the central ethnic organization in each community. Approximately 70% of Korean Americans attend Korean churches, and many Korean elders are involved in activities for senior members[36].

Hispanic elders

Hispanic and Latino are used interchangeably in the literature. In this article, we use Hispanic.

Hispanics account for half (50.5%) of the population growth in the USA since 2000, the fastest growth of any racial or ethnic group. By 2007, Hispanics made up 15.1% of the population. In contrast to past trends, recent growth is more a product of natural increase (births minus deaths) of the existing population rather than of immigration. In fact, only about 40% of the recent increase is the result of immigration. The result is a disproportionate proportion of Hispanic elders who are immigrants in comparison to younger Hispanics[37].

Most recent numbers indicate that nearly half (48%) of Hispanic adults in the USA are women, and that over half of these women (52%) were foreign born. Hispanic women are less educated than non-Hispanic women and are twice as likely to live in poverty. Among Hispanic immigrants, 73% report speaking English less than well[38].

The largest group of foreign-born Hispanics are from Mexico (31%). Foreign-born Hispanic women over the age of 60 account for 7% of the Hispanic women in the USA. These women are the most likely to have low education levels, live in poverty, have limited English proficiency, and be in poor mental and physical health[38,39].

Although there are marked differences among the various Hispanic groups in the USA, most Hispanic Americans maintain strong linkages with their national and ethnic identity through Spanish language TV and radio, frequent travel, sending remittances, and a unique 'culture of migration' that renews and strengthens cultural symbols, values, beliefs, and customs[40, 41]. The family is the most important institution for Hispanics.

It is distinguished by traditional gender roles in which women are expected to take responsibility for housekeeping and parenting. Familism among Hispanics is characterized by strong feelings of identification, loyalty, and solidarity. The family extends to multiple generations, is bilaterally organized, and often includes close friends. Familial behavior includes frequent contact and reciprocity. Typically, the extended family's problem-solving and stress-coping system shares both tangible resources (material support, income, child care, household maintenance) and intangible resources (emotional support, counseling, social regulation)[42,43].

Elderly immigrant Hispanics' traditional roles may potentially be displaced from their extended family (some of whom may still reside in their home country), as well as by younger family members' acculturation to USA norms[44]. Added to the potential for displacement, the practice of keeping problems within the family[45] affect Hispanic family support systems and may have implications for communications and monitoring technologies that could be perceived as particularly intrusive.

Cultural implications

Communication and monitoring technologies have been suggested as useful tools for older adults to extend their ability to live independently. However, these suggestions are built on the Western cultural assumption that people wish to live on their own as long as possible[46]. Both Hispanic and Korean values, family structures, and strong community relationships may challenge that assumption. For example, Asian cultures have been shown to value an interdependent, rather than an independent self-identity[47]. On the other hand, emerging trends in Hispanic and Korean American family structures and care expectations may result in acceptance of Westernized roles for technology across cultures. Cultural dynamics of different subpopulations are also important to consider in acceptance of technologies. As an example from another minority, some African Americans may, in recalling the Tuskegee experiments, be unlikely to accept specific medical devices in the home if they seem too intrusive[24].

Understanding the implications of technology will be important for the well being of minority elders and their families. This qualitative study was designed to explore attitudes and values of older USA minority (Korean and Hispanic) women towards innovative assistive technologies.

Method

Target population

In the USA, as in most countries of the world, older women outnumber older men and the disparity increases with age. Of people ages 65 to 69, 53.8% are female. Of those age 85 and older, the percentage increases to 71.1%. Moreover, high proportions of women, particularly the oldest-old, are widows who live alone. Therefore, older women were targeted for this study.

The USA population is increasingly diverse and the trend is projected to continue. Asian and Hispanic populations are the fastest growing minorities, with growth rates of 63% and 39% respectively over the period 1990-2000[48]. For this study, targeted groups were immigrant women of Korean and Hispanic (predominantly Mexican) origin. Mexican immigrants were selected for this study because they represent 65% of all Hispanic Americans and are highly concentrated in the Western USA, the site of this study. Before 1970, the growth among the USA Asian population was concentrated in American-born Japanese and Chinese Americans. Increased immigration has resulted in more diversity among the Asian population, with Korea being among the highest sending countries[48]. According to the USA Census Bureau, nearly two-thirds of all older Asians live in the West[13].

Data collection

Two methods of data collection were used. A short written questionnaire was used

to collect demographics and information about familiarity with various technologies. Primary data collection was done through focus-group interviewing, a qualitative research technique that uses discussion among a small group in a comfortable environment. Data were collected in 2006. Focus group interviews provide opportunities for people to share experiences that affect their lives and are especially appropriate for limited literacy populations. It is a particularly effective methodology with ethnic minorities, because it is open to informants' stories, avoids questions that have no literal translation[49], and is less likely to lead to a socially desirable response because of a perceived power differential with the researcher[50]. Non-random selection and small numbers of focus groups in this study limits the generalizability of findings; however, insights can be gained from focus group interviews that are not accessible in other ways. The individuals in the focus groups shared similar demographic characteristics. A potential limitation of this approach includes a possible 'polarization effect'.

Participants

Participants in each of the five focus groups were members of social groups or were participants in a northwestern university Extension nutrition education program for limited resource families. Hispanic participants were recruited through the nutrition education programs or were residents of a multi-family housing complex. Thirteen Hispanic women of Mexican and Cuban origin, ages 62-83, participated in one of two focus groups. Korean women were recruited from among Korean church groups. The groups were residents of a suburb of a northwestern metropolitan area or residents of a small northwestern city (population 55,000). Nineteen Korean women, ages 65-83, participated in one of three focus groups.

Procedure

Trained focus group facilitators were females of the same nationality as the focus group members. Sessions were conducted in the participants' native language by these bilingual, bicultural facilitators. The advantage of bicultural facilitators is that participants should feel comfortable sharing their opinions with someone from the same culture/national origin. The potential disadvantage of same-culture facilitators is that a facilitator from another culture may bring an outsider's perspective to the discussion[50]. Each focus group began with a brief 'ice-breaker' exercise to build rapport among group members and with facilitators. After rapport was established, participants completed a brief questionnaire to report basic demographic information and experience with various technologies such as microwave ovens, DVD players, and computers. The focus group discussions were stimulated by four videotaped vignettes of assistive technology in the home of an older adult. The video can be viewed on line at http://www.hhs.oregonstate.edu/healthyaging/cores/assistive-technologies.

To control for possible order effects, the presentation order of the four vignettes was rotated. The facilitator initiated discussion designed to elicit what group members thought of the technology, explored conditions under which the technology would be accepted into the home, and considered individuals with whom the elder would be willing to share the information produced (e.g., neighbors, family members, health care providers). The same procedure of showing the video of the technology as stimulus, and then facilitating discussion among the women, was followed for each of the four scenarios.

The video vignettes were produced by a professional media production company, following a script developed by the researchers. The video was projected to a screen visible to the whole group at once. Vignettes depicted use of: (i) an interactive video communication device; (ii) an emergency monitoring/response device; (iii) a sleep monitor; and (iv) a medication reminder/dispenser. The vignettes were focused on the outcomes of

having such technologies rather than on how they worked. Scenes were primarily action, with little speaking. Where a voice was heard, the language was English. Facilitators carefully explained anything not conveyed clearly by the visual. After each vignette was shown, the following questions were addressed:

- How do you feel about [the scenario and the technology shown] ?
- If you had such a device, how would it be useful?
- What concerns do you have about this kind of technology?
- What benefits do you see with this kind of technology?

The focus groups were audio taped and transcribed in the original language and then translated to English. The two facilitators for the Korean groups were members of the original research team. They each translated the others' transcript, and then jointly reviewed the translations to verify their accuracy. The Hispanic facilitator, a trained researcher, translated her own focus groups from the audio recordings to written English transcripts. The English transcripts were then compared to the original Spanish audio recording by a Spanish-speaking graduate student to verify their accuracy.

Data analysis

Qualitative content analysis techniques[51,52] were used to guide the coding of the English translations of the focus group transcripts to identify manifest and latent themes. Three research team members individually read and coded the transcripts, and the sets of themes were then compared and discussed. With continual reference to the transcripts, the individually identified themes were reconciled. Finally, a fourth team member read and studied the transcripts and themes to ensure that the themes were consistent with the transcripts and that all relevant text was captured.

Results

Sample description

The Korean women ranged in age between 65 and 83, while the Hispanic women were aged between 62 and 83 (*Table 1*). Educational status was somewhat higher among the Korean women. While nearly 85% of Hispanics had less than a high school education, 68% of the Koreans had graduated from high school, vocational school, and/or college. Marital status among the Hispanic women was equally divided among married, widowed, and single, with just one case of divorce/separation. In contrast, nearly 85% of the Korean women were widowed. Because economic status among older people is strongly dependent upon assets and family support, income levels are somewhat inadequate descriptions. Nevertheless, it is noteworthy that over 90% of Hispanic women but only 68% of the Korean women reported annual gross incomes of less than $15,000. In fact, 21% of the Korean women reported annual gross incomes of over $50,000.

All of the participants were immigrants to the USA; however, the vast majority had been in the USA for six or more years. Because many (84%) of the participants were widowed, divorced, or single, it might be expected that most would live alone. However, the reverse was true. Only three Korean women lived alone, and none of the Hispanic women lived alone. It is interesting to note that 28% were living in households with both adults and children, but three of the women were living with children only (less than age 18; no other adults).

Participants were asked to report their use of a variety of technologies including TVs, microwave ovens, DVDs, telephone voice mail, and cell phones. In both groups, over 75% used TV daily and 54% (Hispanic) to 85% (Korean) used a microwave oven daily. Very few of the women used a DVD player on a daily or weekly basis, and 46% (Hispanic) to 59% (Korean) never used one. On the other hand, use of a cell phone was quite different between the groups. While 56% of Korean women used a cell phone daily, only 31% of Hispanic women did so and over 60% of Hispanics never used a cell phone. Similarly, while 60% of Korean women used voice

Table 1. Sample description; Percentages may not sum to 100% due to rounding

Characteristics		Korean n=19 65-83 yrs old		Hispanic n=13 62-83 yrs old	
		#	%	#	%
Education	< High school	6	32	11	85
	High school	8	42	2	15
	Vocational school / some college	1	5	0	0
	College graduate	4	21	0	0
Marital status	Married or living with partner	1	5	4	31
	Widowed	16	84	4	31
	Divorced or separated	1	5	1	8
	Single	1	5	4	31
Annual gross income, US$	≤ 15,000	13	69	12	92
	25,000-49,000	2	11	1	8
	≥ 50,000	4	21	0	0
Years in USA	< 1	1	5	1	8
	1-5	1	5	2	15
	6-9	3	16	5	39
	≥ 10	14	73	5	39
Overall health status	Poor	7	37	2	15
	Fair	9	47	5	39
	Good	2	11	5	39
	Excellent	1	5	1	8
Living situation	Living alone	3	16	0	0
	Living with spouse / other adults	11	58	6	46
	Living with adults + children	4	21	5	39
	Living with children, no adults	1	5	2	15

mail daily, only 8% of Hispanic women did so, and 75% of Hispanic women never used voice mail.

Participants were also asked to report their use of a computer. Nearly 90% of Korean women and 77% of Hispanic women never used a computer. The two Korean women who did use one did so at least once a month while the one Hispanic woman who used one did so less than once a month. Use of e-mail and internet followed the same pattern.

Emergent themes

Korean focus groups

Among women in the Korean focus groups, six predominant themes emerged: (i) willingness to use technologies; (ii) issues of usability and reliability; (iii) issues of safety and independence; (iv) fit with cultural values; (v) impact on social interaction and connectedness; and (vi) issues of privacy and vulnerability. Within each of these themes, a mix of positive and negative opinions were expressed.

Willingness to use technologies. Overwhelmingly, the Korean women who participated in our focus groups were willing to try technologies that might increase their ability to stay independent. However, an expressed concern was that life could be made too easy, leading to reduced physical activity and accelerated decline. Further, no par-

ticipants, regardless of health status, felt that they were in need of assistance 'yet'.

"….[It] is excellent for people like me who live alone. At present, I am healthy and can take care of myself, but the device will be useful for those who are older…."

"The technology becomes more advanced, more and more. I need to move less and less."

Issues of usability and reliability. Although the participants were encouraged to focus on concepts, there were many comments about specific design features of the technologies featured in the vignettes. Conceptually, they were most concerned about the cost of purchasing and maintaining the equipment and about potential barriers for non-English speaking people. There was also concern that electromagnetism created by the devices would negatively impact their health.

Issues of safety and independence. Participants expressed a strong belief that monitoring and emergency response technology would be important in an emergency situation. Many related anecdotes of people they knew who had fallen or become unconscious and were not found for an extended period. In addition, because of limited English proficiency, many were concerned that calling 911 would not be helpful. They liked knowing that they could easily contact a family member in an emergency.

"It will increase the life time because if you get into an accident….you will be discovered sooner and can get to emergency room before it is too late….I think the devices will help older people to increase their life times by about five years".

The medication reminder/dispenser was seen as particularly helpful, as many related times when they had forgotten to take their medications or had mistaken the time or amount.

"I sometimes forget to take medicine, I forget the time…."

"I heard that many people have died due to the wrong medication and over dosage…. Koreans are concerned about medicine too much. For example, I take medicine because I have a pain in my leg. One of my friends also takes the same medicine because she thinks it is good for her even if she does not have the same symptoms".

"They like to take medicine too much".

Fit with cultural values. Traditional family structure among Korean Americans tends to be hierarchical and patriarchical[32,53]. The importance of the extended family and strong intergenerational relationships allow for reciprocity in caregiving at multiple points during the lifespan[36]. Not surprisingly then, participants expressed a desire to contact family when needs might arise but they wanted to avoid burdening their children as much as possible.

"I try not to be a burden to my children. All I can do is get my medication and ride bus to hospitals. If I cannot do these, I ask my siblings for help….So far, I can take myself outside. If I need help on other things, then I ask my sibling for help".

A uniquely Korean value emerged in the discussion of the sleep monitor. Dying while sleeping is considered very lucky in the Korean tradition. Participants were concerned that technology might interfere with their luck.

"Korean proverb says, "Are you ok overnight?""

"I will be happy if I die while I am sleeping. I do not care [about emergency response technology] while I am sleeping in bed, no problem".

Impact on social interaction and connectedness. Participants viewed the technology as useful in keeping appropriate levels of social interaction when older people are isolated from their families, both those nearby

and family members still living in Korea. Although the potential for technology-enhanced communication to become intrusive was considered, there were no negative comments about that.

"*The elderly people who live alone usually feel lonely and want to see their families….I think it may comfort them*".

"*The elderly people are full of life when they receive the phone call from their children. I believe the older people are happy when they hear their children's voices. Besides, they can see their children's faces with the video phone. Then they are happier*".

"*I actually hoped that this kind of device would be created and I want one. As I age and become lonely, it is necessary to have this kind of device to go through daily lives*".

Issues of privacy and vulnerability. Monitoring technologies may have the potential to invade one's privacy. Although the monitoring technologies portrayed by the video vignettes made it clear that only motion was being monitored and that no one was actually seeing inside the home, some of the participants discussed that possibility. Surprisingly, they were not overly concerned about that, feeling that the ability to remain at home longer was worth a trade-off with reduced privacy.

"*For example, the person who is monitoring might want to take a peek although the person who is being monitored did not ring for the help. This could happen, right? So, they can get bored and try to monitor people's lives without permission….If they want to take a peek, then let them. We are too old to worry about this [laughter]*".

"*The old people like us have no secret. I think so*".

Participants were willing to have information collected through monitoring shared with family (especially their children), close friends, and their health care professionals. However, they did express concern about vulnerability to unscrupulous individuals.

"*Even without [the technology]…many older people are being cheated all the time…although the device was created for good use, if it falls into the wrong hands, many older people will become victims of cyberspace aid systems*".

Hispanic focus groups

Among women in the Hispanic focus groups, predominant themes emerged in all of the same categories as the Korean focus group themes. The Hispanic themes were: (i) willingness to use technologies; (ii) issues of usability and reliability; (iii) issues of safety and independence; (iv) impact on social interaction and connectedness; and (v) issues of privacy and vulnerability. One Korean focus group theme, 'fit with cultural values', was not apparent in the Hispanic discussions. For the common themes, a mix of positive and negative perspectives were expressed by Hispanics, as they were among Koreans.

Willingness to use technologies. Like the Korean participants, Hispanic participants expressed willingness to use the technologies at some time in the future; however, they did not feel the need in their current circumstances.

"*Well, it seems like a good thing. Like I've said, right now we may not need it but one never knows when the time will come that we do*".

Although the 'not yet' attitude was shared among all groups, Korean participants were concerned that relying on technology might accelerate decline as a result of moving about less. This concern was not brought up by the Hispanics.

Issues of usability and reliability. The primary usability issue for Hispanic participants was the perceived high cost of the technologies. Closely related to that concern, especially for the communication technology, was availability for relatives who live in their homeland.

"*For me, I see those things…would be good, but they cost a lot of money*".

"*There are people that live far way….and they don't have TV. And I have a family member [in Mexico] that says, 'why don't you call?' but she lives out in the boonies where there's nothing…..So we don't talk…. I'd like to send them money to buy [a communication technology]…but I couldn't afford it*".

A usability concern shared by both Korean and Hispanic participants was that English instructions and controls would be problematic. They universally expressed hope that the technologies could be made 'friendly' for non-English speakers.

Issues of safety and independence. Hispanic participants expected that the monitoring and emergency response technologies would be important for safety. However, there were mixed comments about how such devices would affect feelings of independence.

"*Sometimes one is alone…and you wake up and then you can't sleep. And you're lying there thinking. But if you had…this device, I think you would feel less anxious*".

"*If you could live alone, and you know,… your family doesn't bother you. Sometimes the family doesn't like for example if you don't wash the hands….With this new thing, I can talk to my family and live alone*".

"*I think it would make you feel protected…. Yes, protected and pampered!*"

"*[With the device] nobody has to say, 'well, who's taking care of you?' Because when something happens it's 'you have to live with someone.' Now they can be watching you….It feels like I'm a child, but it feels ok*".

Impact on social interaction and connectedness. There was a great deal of discussion among the Hispanic participants about the impact of technologies on social interaction and connectedness. Participants spoke of the importance of family and difficulty in staying connected with busy family members and especially with those living far away.

"*[I would like the videophone] because you wouldn't just have the telephone but you'd be able to see them..I get on the telephone and..say "I'm here alone. Nobody is here, nobody coming to visit." When they come, it's great. But when they don't it makes me sad*".

"*For me, [I would like to use technology] to see family members in Mexico*".

"*I would love to talk with my sister or my brother and be able to see them. Wow, how great that would be! Because just talking on the telephone, you greet each other and ask how you are. Well, fine, and I'm fine too. Everything's fine. But there are times when it's not, and sometimes people don't tell the truth. And you can't always tell just with the voice, so if you could see them…yes, I would really like that*".

"*With that,…they won't forget you. Sometimes days go by….Years, and you don't know what's going on*".

"*What the eyes do not see, the heart does not feel, isn't that right?*"

Issues of privacy and vulnerability. There was very little variability in participants' feelings regarding technology's impact on privacy. Hispanic participants seemed to feel perfectly comfortable having information about daily activities (such as sleep patterns, medication compliance) that was collected by a high-tech monitoring system made available to a wide range of people. When asked specifically about who should have access to the information, responses uniformly included health care professionals, children, and even close friends. Unlike responses from the Korean groups, Hispanics made no mention of compromised modesty or vulnerability.

"*Today, yesterday…they open the door to see how I'm doing. That's just what we do…. It's not like I'm doing anything bad*".

"My dad says, 'oh, let everybody know' ….whatever—it doesn't matter to him".

"There are people who like to help others but they don't help you because they don't know that you need it".

"There are times when a family member isn't there and if another person can help me, [it would be fine]".

Discussion

This study was guided by a model that integrates Life-Span Theory of Control and the Congruence Model of Person and Environment Interaction (*Figure 1*). Readers are invited to see Mahmood et al.[19] for a discussion of the development and further applications of the model. While the integrated model is conceptual, it is useful to organize emergent themes in terms of informants' decision making processes. The integrated model guiding this study suggests that using gerontechnology as a compensating factor for person-environment incongruence may have social and emotional effects. In further studies, it will be important to explore these potential outcomes.

There are a number of limitations of this study which must be recognized. Participants in the focus groups were recruited from residential complexes and from among existing social networks. Since they were not a randomized sample, generalizations to the greater population cannot be made. Further, expression of divergent individual opinions may have been tempered by social constraints. While the facilitators were native speakers of the languages, they were representatives of 'university' and could have been perceived as authority figures. Even though the focus group questions were presented in neutral terms, participants may have responded in ways they thought would please the facilitator. Finally, Korean and Hispanics are only two of many minority populations in the USA, and it would be a mistake to consider the results of this study as characteristic of all minorities. In fact, an important consideration for this study is that we must be mindful of the broad diversity of cultural norms in the design or promotion of gerontechnologies.

Results of this study suggest that older USA minority women are open to the potential of gerontechnologies to support well being in old age. This open-minded attitude is consistent with findings in other studies. Similar to the present study, Wild, Boise, Lundell, and Foucek[54] conducted focus groups to study the perceptions of USA non-immigrant older adults regarding unobtrusive in-home monitoring. Dominant themes were maintaining independence, detecting cognitive decline, sharing of information, and the trade-off between privacy and usefulness on the technology. Some of the emergent themes in the present study were similar and were consistent between both minority groups as well. However, this study suggests that diverse cultural norms and experiences may introduce different perceptions which could conflict or interfere with the use of gerontechnology. In our study for example, we found that immigrant participants worried that devices created for USA users would be difficult for them (with limited English proficiency). Other examples include misconceptions about the physical effects of using electronics, and concern with preventing a 'natural' death (*Table 2)*.

The integrated conceptual model suggests the gerontechnology will be considered only when the user perceives a lack of person-environment congruence. In this study, even though nearly 1/3 of the participants (10 of 32) reported poor health status, none felt they were at a level that the featured technologies would be useful. Therefore, self-determined 'need' may not be the best indicator of when and how new technologies should be introduced into the home. Further, even when a lack of congruence is recognized, the integrated model suggests that external and internal factors may influence the decision. In their review of gerontechnology literature, Cohen-Mansfield and Biddison[55] note that the use of technology

Table 2. Comparison of emergent themes; +: positive comment; -: negative comment; =: neutral comment

Themes	Korean n=19 65-83 yrs old	Hispanic n=13 62-83 yrs old
Willingness to use technologies	+ very willing to try	+ very willing to try
	- concern that reduced physical movement would contribute to decline	- strong 'not yet' attitude
Usability and reliability	= moderate concern about cost	- strong concern about cost
	- concern about language barrier in using device	- concern about language barrier in using device
	- concern about physical effect of electronics	
Safety and independence	+ important for emergency situations	+ increases ability to live alone
	+ medication reminder / dispenser particularly helpful	+ reduces anxiety
Cultural value fit	+ appreciate ways to reduce caregiving burden on adult children	This theme did not emerge among Hispanic groups
	- resist interference with natural death while asleep	
Social interaction and correctness	+ appreciate potential for connecting to family members in home country	+ appreciate potential for connecting to family members in home country
	+ useful in avoiding feeling isolated	
Privacy and vulnerability	= little concern with personal modesty	+ no concern mentioned with personal modesty
	- concern about vulnerability if technology is in the wrong hands	= little concern with information widely shared

has both the psychological benefits of increasing independence and self-respect and the economic benefits of substituting expensive personal care with equipment. Elders who wish to retain personal control and avoid burdening their children may consider gerontechnologies as a way to: retain personal control; reduce the need for personal, paid assistance; and alleviate worries and anxiety among elders' adult children. Before such recommendations are made to minority elders -or to anyone- it will be important to validate the perceived and actual value of such technologies by those who provide the care. Cohen-Mansfield and Biddison[55] found that caregivers were especially interested in technologies that assisted with activities of daily living and Mahmood et al., have also pursued some of these questions[19]. The 'not yet' attitude expressed by some of the participants in this study is also consistent with the person-environment (P-E) literature. While environments must be supportive enough that residents can maintain maximum independence, they must simultaneously offer enough challenge to be stimulating. Learning to use new technology can be challenging and older adults, like all people, are best motivated when perceived benefits outweigh perceived costs.

Results of this study are relevant to the design of gerontechnologies in general and of communications and monitoring technolo-

gies in particular. Designers should be sure that perceived costs -such as issues of language and general usability, privacy, and reliability revealed in this study- are not misconstrued by potential users and that benefits are clearly evident[56].

The 'digital divide' has been an important area of inquiry in social science since the mid-1990s[57]. Of specific concern are the potentially significant implications for social stratification caused by unequal diffusion of internet access and use[58]. Rates of internet use are about 60% for Asian-Americans, 60% for non-Hispanic whites, and just under 32% for Hispanics. Among Americans age 15, nearly 80% are 'on-line', while for those groups over age 55, rates decline rapidly[58].

The development of the world wide web and the evolution of a host of web-linked communications technologies has changed the internet. No longer simply a source of information, the internet is increasingly a vehicle for social interaction. With the development of on-line communities, young and old alike are making extensive use of the internet for social networking[59].

For minority elders with strongly traditional cultural values, the ability of communications technologies to help maintain extended family ties may be an important benefit. Already, communication technology is considered essential -and fun- among younger users. Younger family members may provide the best inroads in helping older users appreciate the benefits of appropriate communications and monitoring technologies as well as helping them master the needed skills[57].

Gerontechnology research about the needs and concerns of minority elders is urgently needed. As pointed out by Wykle and Ford[46], intergroup differences and differentiation between minority and majority cultures are not well known. Further, long term outcomes have not been studied. In addition to the needs and concerns of elders, the needs and concerns of their adult children and other informal caregivers are important. We have begun explorations into this in a subsequent study[60].

Today, there is an unprecedented and sustained movement toward a global culture[61], so it is important to view these results in the context of cultural values and expectations. The Western definition of independent 'aging in place' may have alternative definitions and profound implications among people with diverse cultural values. Before universally promoting any gerontechnology, further research should focus on the unique perspectives, needs and expectations of cultural groups.

Each life story is shaped by the environment: the physical setting, the social and economic context, and the cultural milieu[62p77]. Unique cultural values may be quite different among the many ethnic groups. For example, a Western assumption that people wish to be independent of their extended families does not hold up in every culture[47]. As gerontechnology research moves forward, it will be important to keep this in mind in the design, selection, and use of any new tool.

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