

Designing an augmented print media system to promote social interaction in nursing homes: a preliminary study

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ABSTRACT

Positive peer relationship in long term care facilities is an important component of residents' life quality. Hosting various activities in the public spaces of nursing homes has long been a typical and effective intervention to enhance residents' social engagement. However, such interventions have their limitations in providing continuous influence on residents' social wellbeing. We have the hypothesis that designing augmented print media systems would improve this situation. This paper presents a preliminary user study aiming to investigate nursing home residents' use of print media, their social preferences of genres and their current social scenarios and barriers related to print media. Based on the results, we summarized several print media products and genres that have potential to be augmented. Besides, future scenarios and three design strategies are derived to guide the design. We think this study can contribute to a deeper understanding of how to design applications for computer-mediated social interaction between nursing home residents.

Author Keywords

Aging; nursing home; print media; augmented media; social interaction

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION

Problems of traditional social interventions

Social milieu is one of the most important components of quality of life in nursing homes [13]. Besides the close relationships with friends and family members, positive and meaningful peer relationship between nursing home residents can also contribute to their experience of thriving [2]. In addition, the impoverished social ecology in

public caring environment can undermine residents' overall wellbeing and the provision of adequate therapeutic care [4]. In the past decades, in spite of the improvement in designing physical caring environments, the interventions designed to improve the social ecology of nursing homes have changed very little [9]. Organizing various scheduled programs has long been a common intervention to engage residents in social activities [18]. Although a lot of interventions have been proven to be effective and many residents claim to enjoy such activities [1, 6], boredom, loneliness, and helplessness are still reported as common problems in caring environments [9]. Many surveys report that most residents spend a large portion of their day in their private rooms alone and inactive rather than going to the public spaces in nursing homes that are designed to facilitate their social interaction [3]. Several reasons can explain the limited effects of traditional interventions on social ecology in public caring environment. First of all, the activities are usually held in public only on an intermittent basis, which lacks continuous influence on residents' social feelings and behaviors. Residents have to entertain themselves in the rest of their time, which can easily lead to an inactive lifestyle. Secondly, since nursing home is a distinct institutional social space where seniors from different backgrounds live together, interventions based on certain themes are difficult to meet the variety of needs. Last but not least, traditional interventions are usually led by caregivers and passively followed by residents (see Figure 1). Researchers in this field argue that residents also need the freedom to choose whether to be social or not at a certain moment in order to maintain a sense of individual control [5]. The provision of social opportunities is more beneficial to them than enforcing social interaction. As a result, there is a need to explore innovative approaches to fill the gap.

Media in nursing homes

Providing a wide variety of print media (books, magazines, newspaper, etc.) in public spaces is one of the traditional strategies to continuously entertain residents and create social opportunities. Because of its natural and friendly interface, print media has long been an important media for the older generations. It is also an ideal media in public spaces for its unobtrusiveness. However, because of the degradation of sight, mobility, memory and concentration, reading print media is getting much less attractive for the elderly. Many reports reveal a much lower

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consumption of print media in old age [11]. In addition, the social effects of traditional print media are very limited. Reading and sharing what is being read can hardly take place simultaneously especially for the elderly.



Figure 1. Traditional interventions are usually led by caregivers and passively followed by residents.

Ever since the prevalence of television, watching TV has become the substitution of other media for many nursing home residents. Many studies report the elderly using television more than any other demographic group [14]. Besides, in spite of the booming of digital media, recent findings report television still ranks as the most prevalent and most time-consuming activity for the elderly [14]. However, many theories of media use among the elderly portray high television consumption as problematic. In nursing homes, spending large amounts of time in watching TV in private spaces can lead to problems such as lowered self-concept, depression and low levels of interpersonal communication [7, 8]. Some nursing homes also tried to continuously play TV programs in public spaces but it is difficult to balance individual choice and administrative control. In the recent decades, digital media such as music, photos and videos, with its rich means to display and trigger interactions, has been widely used in public spaces to connect people in a certain area. However, given the elderly's acceptance and ability to use digital media, they have long been playing a minor role in research and design to encourage computer-mediated social interaction in public spaces. Although some studies have explored to integrate interactive digital media technology into public caring environments, these applications can hardly blend in residents' daily life.

Potential of hybrid media in nursing homes

Based on above mentioned, since different media has its advantages and disadvantages if it is applied in nursing homes, we have the hypothesis that hybrid media could be a promising solution. Hybrid media is referred to as combinations of contents and functionalities of two or more media products. One of the examples is the

combination of digital media and print media [11]. Augmented Reality (AR) has become one of the technologies associated with hybrid media. If we augment print media with related digital contents and present them in a situated public display, nursing home residents can not only read information, but also enjoy extra rich multimedia contents. In addition, hybrid media can also make reading and sharing a much easier task for the elderly. They can both interact with their familiar interfaces and make full use of multimedia. We hypothesize that such augmented print media system in public spaces would be a promising platform to facilitate residents' social interactions.

Before designing such systems, several questions need to be addressed. For example, among so many kinds of print media provided in nursing homes, which have potential to be augmented? Which genres of print media products have potential to trigger residents' social interaction? However, in this research topic and its special context, very few studies can directly guide how to design such systems. Most related studies focus on the general media use and preferences of the elderly, but we also want to know nursing home residents' specific print media use in their private and public spaces respectively. In this paper, we present a preliminary study aiming at the insights and guidelines for the future design.

METHOD

To understand nursing home residents' use of print media and the relationship between social interaction and print media in nursing homes, a qualitative approach through semi-structured interviews was chosen. This study focused on the following questions: 1. How residents use different print media products? 2. Which genres of print media have potential to trigger social interaction between residents? 3. In which situation can current social interaction be triggered by print media in nursing homes? 4. What are the barriers of print media to trigger social interactions between residents?

Settings and participants

This study was conducted in two typical nursing homes in Eindhoven, the Netherlands. Both of them are equipped with private apartments and multiple public spaces. The public spaces consist of one primary multi-functional space and several secondary spaces. The primary space is usually where residents eat, drink, socialize with each other and participate regular activities. The secondary spaces are designed with specific purposes such as reading spaces, game rooms and meeting rooms for small groups. Twenty-one residents participated in this study, ranging in age from 66 to 95 ($M=82$). Ten residents are from Vitalis Beckelhof (3 males, 7 females). Eleven residents are from Vitalis Kronehoef (4 males, 7 females). Since both of the two nursing homes have a closed area for residents with dementia, all of our participants had lucid minds and were chosen randomly in the open spaces within each nursing home.



Figure 2. We designed a series of cards to facilitate interviews

Procedure

To answer the first two questions mentioned above, we prepared a list of common print media products and genres of print media for the participants to choose from. Since many residents have difficulties in browsing intensive information within a short time, we prepared a series of cards to represent each kind of print media and genres (see Figure 2). Each card was designed in a combination of an image and Dutch texts for the elderly to quickly have a clear understanding. The list of common print media products is based on the classification from Kipphan's book 'Handbook of Print Media' [10]. We revised the list based on our observation in nursing homes to suit the context. The final list consists of 10 print media products in caring environments including books, billboards, brochures, flyers, magazines, menus, newspapers, posters, photos / albums, postcards / letters. Our list of genres is based on the classification for books from the online shopping website Bol.com and it is also revised for our context. The list is composed of 29 genres including activities in nursing home, architecture, advertisement, art, biography, culture, comics, cook, family, fantasy, health and psychology, hobby, house, history, kids, life in nursing home, management, news, nature, photography, politics, romance, religion, sport, study, travel, thriller, TV programs and young adult. In addition, in order to facilitate the elderly to answer the third and the fourth question, we took photos of some typical public locations in the nursing homes and also printed them as cards to help the elderly recall and describe the scenarios. The three kinds of cards were printed in different colors (see Figure 2) to make it easier for the experimenter and participants to distinguish.

In the beginning of each interview, participants were given a brief explanation on the objectives of the study. After

asking their basic information (name, age, room number, education background, employment history) in the first part of the interview, we asked them: "What kinds of print media do you usually use?" We then showed them the 'print media' cards one by one, and told them they could choose as many as they like. Then, among the cards they had chosen, the participants were told to choose which of them they used in their apartments and which in public spaces or both. Similarly, we then showed them the 'genre' cards one by one and let them to choose as many as they like (see Figure 3). Among the 'genre' cards they prefer, they were told to choose which of them they would like to talk with other residents. As the elderly are a vulnerable group, and may experience some difficulties in recalling and expressing, we used the 'location' cards to led them to talk about the current social scenarios related to print media and barriers they encountered during choosing cards instead of directly asking them to describe them.



Figure 3. The resident was browsing and selecting cards

Data collection and analysis

The first part of our interview elicited demographic information of each participant such as age, education background, employment history and prior experience with technology. The data were then analyzed using descriptive statistics. The selection of cards was recorded in two categories: their use of print media, their preference of genres of print media. The first category was divided into three parts: the print media they usually use in general, in their private apartments and in public spaces. The second category was divided into two parts: their personal preference and their social preference of genres with other residents. The interview sessions on their current social scenarios related to print media and barriers they encountered were audio-recorded, and were later transcribed and manually analyzed in NVIVO using the thematic analysis technique.

RESULT AND DISCUSSIONS

Demography

Among all twenty-one participants, one female was from the age group 60-69. Two females and one male were from the 70-79 age. Our participants were mainly between 80-89 years old. There were ten women and four men. Three participants were above 90, two men and one woman. All of them could read and write. College education was their highest education level. Only four participants received college education; three of them were men. Seventeen participants received elementary school education; two females did not finish their elementary education for helping housework in their family. Most of our participants were born in 1930s to 1940s. This is a generation that had experienced the Second World War when men had an absolute priority in higher education. Many schools were established to teach women about housework. In terms of employment history, thirteen participants (2 males, 11 females) had non-professional careers such as housewife, tailor, factory worker, waitress and cleaner. Eight of them (5 males, 3 females) had professional careers such as engineer, administrator, civil servant, teacher and secretary. Television and print media products are their main information sources, only two females could simply use smart phones, they were taught by their family and had difficulties in searching information they need from the Internet. None of them could use computers.

Use of Print Media

The blue bars in Figure 4 describe the print media products usually used by residents in general situations. As shown in the figure, posters, billboards, brochures and flyers were the most used in their daily life. From the interviews, we knew these products were mainly provided and maintained by caregivers. Residents highly relied on them to get access to the information about upcoming activities and care services in nursing homes. Although they also had digital screens displaying such information, many residents still insisted to keep the printed version because digital contents kept changing and would not wait them to fully get the information. Out of these 4 print media products, flyers and brochures were used more than the other two because they were put on the tables where it was easier for the residents to get access. The following popular product was newspaper. Even though television was their main news source, 15 of them still had a habit to read newspapers. Magazines, menus, photos / albums, postcards / letters and books were a little less popular in general, and there were not significant differences between them.

The red and green bars summarize the participants' use in their own apartments and public spaces respectively. They indicate that all the four most popular print media products were only used in public spaces. As for newspapers, 8 participants usually read it in public spaces because the

latest newspaper was always put on public tables. Drinking coffee, reading newspapers and waiting for possible social contacts has become an important part of their typical daily routines. Six participants preferred to read in their own rooms mainly because it is much more comfortable and quiet. They usually subscribed their own newspapers and sometimes bring them to public spaces after they finished reading. One participant had no special preference of where to read newspapers. For similar reasons, although there were reading tables and mini libraries in both nursing homes, none of the participants read books in these areas. Twelve residents preferred to read in their apartments because they need more sustained attention for books than newspapers. Regarding magazines, there was no significant difference between locations. Five participants usually read in their rooms, four often read in public spaces and three did not have preference. It depended on their interests and situations. As we can see from Figure 4, most participants chose to use photos / albums and postcards / letters in their rooms (84.6% and 76.9%). Most of them were only interested in photos and postcards related to their own life and always kept them in their rooms except special occasions. Only one woman put her albums in her trolley and took them out everyday for sharing.

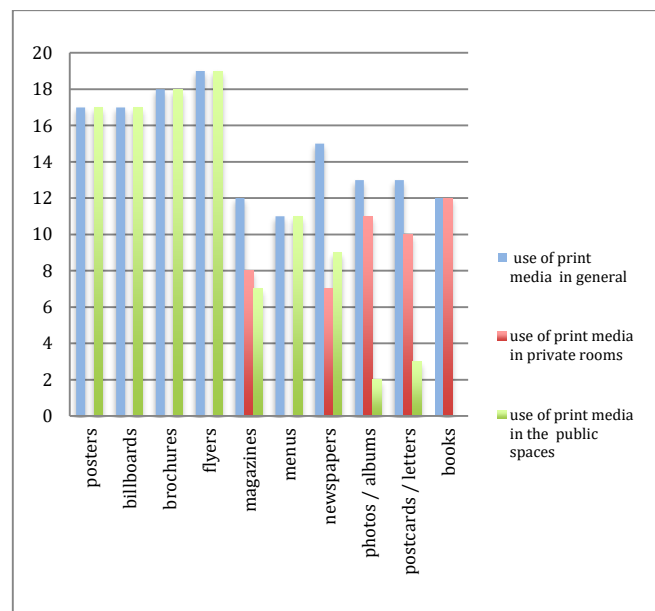


Figure 4. Residents' use of print media in general, in private and in public spaces

Preferences of Genres

Figure 5 summarizes participants' personal interests in genres of print media and their social preferences of these genres. News was not only their favorite genre but also the most popular topic they would like to talk about with other residents. As reflected from the interviews, exchanging opinions on recent news helped them to engage in daily social conversations. Most of them felt more social connection to talk about local news or news from their neighborhood much more than national or even

international news. Such news could also include genres such as politics, activities in nursing home and life in nursing home, which would resonate with other residents. They mainly got such news from newspapers, posters, flyers, brochures, billboards and magazines published by their caring organization. Although nature was their second favorite genre, it was not that popular when it became a topic. They found it was easy to start a conversation with nature such as weather and outside sceneries, but such communication was hard to sustain and was quickly changed to other topics. In addition, comparing to texts and static images about nature, they prefer dynamic contents from TV programs. History was another important subject, 15 participants liked print media products related to history and 11 of them would like to talk about it with others. To be specific, the history related to their past life may attracted them much more than general history. This topic may more or less overlap with other genres such as family and travel, which they also would like to talk about. When they talked about their travel experience, it could also be related to local culture. These genres usually came from photos / albums, postcards / letters and magazines. Besides, they indicated that although topics such as news, activities in nursing home and life in nursing home were frequently mentioned in their conversation, topics about history, family and travel experience could trigger more meaningful conversations because they were more personal. Health and psychology has always been one of the most concerns for the elderly. They paid attention to health related contents and shared with others. However, many participants admitted such conversations were mostly focus on their own health complains and few people really interested in it. Romance, fantasy, biography, thriller were typical genres of books. The majority of our participants treated reading books as a self-entertainment activity. They rarely share with others except in special occasion such as reading clubs. Genres like sports, art, hobby, photography, architecture and religion depended highly on personal interests and beliefs. Other unpopular genres mostly related to self-development such as study and management, which could also be explained by many aging studies like Carstensen's Socioemotional Selectivity Theory [12]. It argues that when people are getting old, their social focus would gradually shift from future-oriented and knowledge-related goals to present-oriented and emotion related goals.

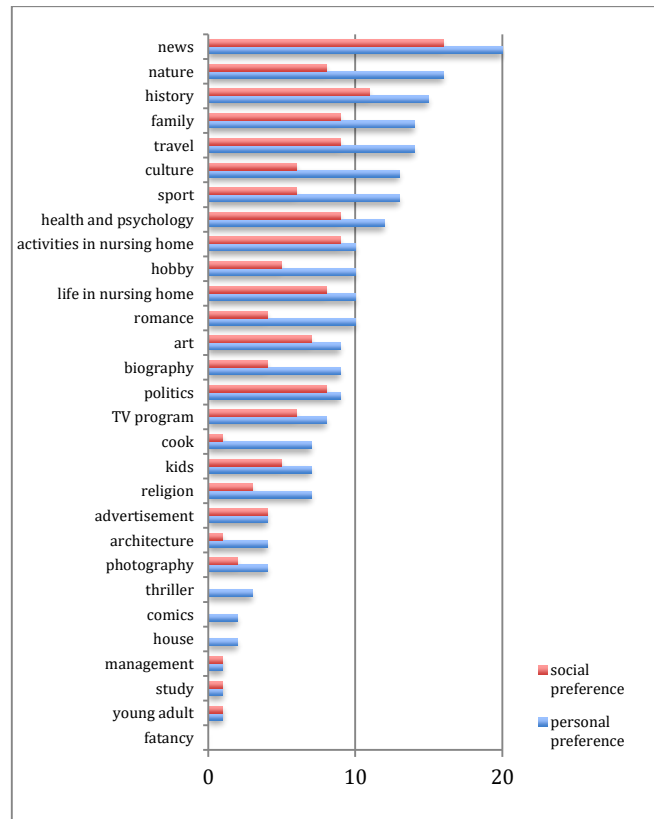


Figure 5. Residents' preference of genres from print media products

Current Social Scenarios and Barriers

The participants were asked to recall print media related social experiences and barriers when they were choosing cards. However, based on the interviews, traditional print media can hardly trigger substantial social interactions. Most of their social experiences about print media were based on physical exchanges. Such scenarios usually took place with their family members. Their families brought print media products such as newspapers, books and magazines that would meet their interests. They would discuss about them during the next family visit. For the residents who had reading problems, sometimes their families would read for them to overcome physical barriers, which they thought was a good way to enhance their emotional bonding. But it rarely took place more than once a week because their family members were often busy. Sometimes, they also borrowed or loaned print media with other residents, but they seldom talked about it after using and even less often to use it together. Another barrier they complained was hardly to find the right person to share the right topics. Unlike the close relationship with family members, most relationships between residents were no further than acquaintances. Although they met and communicated almost everyday, they lacked the opportunities and abilities to express their own interests and find people who had the same ones. Self-interest is a central property of many social studies such as social exchange

theory [16]. In 1981, Michael Roloff claimed that self-interest would act as the guiding force of interpersonal relationships for the advancement of both parties' self-interest when it is recognized. Normally, people's interest could be reflected more or less by what they read or use. But for the elderly, traditional print media cannot help much to disclose residents' self-interest in public caring environment. A lot of participants held the opinion that social interaction and using print media were contradictory behaviors in public spaces base on their past experience. "When you are reading something in the restaurant, you isolate yourself." One of the participants said. Social exchange theory model also argues that people calculate the overall worth of a particular relationship by subtracting its costs from the rewards [15]. When people are getting old, the social cost is getting higher because of overall physical difficulties. Most of our participants had similar negative social experiences that they had shared what they liked with wrong people and then got frustrated, so they would not try anymore and became more passive because of the higher cost, which might have caused vicious circles. This could also explain their complains about limited, repetitive and superficial topics every day, which could have been changed by contents from print media but lacked opportunities.

Design Strategies and Future Scenarios

Based on the results of the preliminary user study, we think that if we could design a system to augment print media in public spaces within nursing homes, we could not only reduce their reading difficulties, increase its attractiveness, but also create opportunities to continuously feed them meaningful topics and expose they own interests. For example, this system could detect residents' typical reading behavior such as pointing printed content or flipping pages, corresponding digital content such as digital images and videos would be presented by a nearby public display. Reading would be much easier especially for the residents who cannot read small letters or those who can hardly keep their attention. Sharing would also be more attractive because they would not need to read first, and then understand and explain to others. They just need to select what they want to share and enjoy with others. Furthermore, residents would have more sense of control to determine when and what to share. The results also indicate several promising print media products and genres to be augmented.

Three design strategies were derived based on this preliminary study:

Comply with residents' current habits

The results show that brochures, flyers, magazines, menus, newspapers are the common products in public spaces. We eliminated poster and billboard because they were attached to walls and social interactions can hardly be sustained when residents stand. We can match them with popular and suitable genres such as activities in nursing home, life in

nursing home, news, health and psychology. For example, musical activities held in nursing homes can be digitally recorded by caregivers and digitally embedded in physical brochures, flyers or magazines. Residents who have not joined could also enjoy it afterwards. Besides, for those who love music, they can also review the activities and exchange their feelings whenever they like. Physical newspapers can also be connected to the Internet to provide real-time digital news, which can not only help residents who have difficulties to read small fonts, but also provide them with unlimited topics everyday.

Introduce new potential print media products

Although one of the main purposes of this study was to investigate nursing home residents' use of print media in the current situation, we were also interested in the possibilities to involve new print media products to better cater their preference. These potential products may become more attractive than current ones if enhanced by design and technology. For example, places where they had been were frequently mentioned when participants chose their preferred genres such as news, history, family, and travel. As we know, place attachment is an important concept that has been discussed in many aging studies. It is referred to as the emotional bond between person and place. It is also related to experience of their life course and themes of self-identity that span that life course [17]. Usually, nothing could be better than a map to convey location-based information, but traditional maps rarely exist in public paces of nursing homes. There could be many reasons: Firstly, the printed tiny letters and complex information are difficult to read by the elderly. Secondly, reading traditional maps could be boring and hard to trigger social interaction because they lack proper feedbacks. Therefore, if we could provide physical maps related to residents' life experience in public spaces and link them to location-based information from the Internet such as Google Street View or streaming media uploaded by younger people, they may be motivated to explore together and share their own related stories.

Augment residents' personal print media products

As was reflected in this study, there were many print media products mainly used in residents' own rooms such as photos / albums, postcards / letters, magazines or books. These products are more related to sensitive and personal genres such as: family, history, travel and personal interests (art, sports, culture, etc.). If we could improve the pleasure to use these products in public spaces and the convenience to share by adding digital layers, residents would be motivated to take them out more often. For example, postcards sent by residents' families and friends were used to be kept in their drawers and rarely shared in public spaces. But if they could watch their family videos embedded in these postcards somewhere in the public spaces, we suppose it would be a motivation for them to use postcards in public spaces. Furthermore, it may also be helpful to enhance their family bonding.

Since these three strategies aim to change residents' behavior in different degrees, the first strategy could be the most acceptable for the residents because it conforms to their current daily habits with the lowest learning costs, which makes the first strategy to be an ideal solution to start with and cultivate user habits. The related genres such as news and activities in nursing homes are common topics to every resident and would be effective to improve their interests and frequency of social interaction. Although the second and the third strategies are more challenging, and their related topics are personal, we suppose that, by sharing self-interests, relationships and past experiences, it would be helpful to improve their quality of interaction and feelings of social connectedness.

FUTURE WORK

Base on the results of this preliminary study, we supposed the augmented print media system in nursing homes would make reading and sharing more attractive. To start the following studies, we will first investigate residents' acceptance and attitude to the system. Then, we will focus on designing the augmented print media system in public caring environments. We will start with the first design strategy and choose a potential print media product as an example for further exploration, such as newspaper. A series of co-creation sessions will be conducted in nursing homes to uncover design ideas with residents. To begin with the co-creation, we would explore the potential printed and digital content related to newspaper for augmentation. Some basic design criterion could also derive in the first session. Then, we would focus on developing the form and interaction of the design by prototyping. Refined prototypes will be evaluated to investigate how this system would influence residents' feelings and behaviors.

From a holistic perspective, after diving deep in the first strategy, we will also be interested to explore whether this system would be adaptable for the other strategies. More evaluation sessions will be conducted to explore the attractiveness and social effects of the design solution. Results of the evaluations based on different strategies will be further compared and discussed.

REFERENCES

1. Allen-Burge R, Burgio L D, Bourgeois M S, et al. Increasing communication among nursing home residents[J]. *Journal of Clinical Geropsychology*, 2001, 7(3): 213-230.
2. Bergland Å, Kirkevold M. The significance of peer relationships to thriving in nursing homes[J]. *Journal of clinical nursing*, 2008, 17(10): 1295-1302.
3. Brawley E C. Environmental design for Alzheimer's disease: a quality of life issue[J]. *Aging & Mental Health*, 2001, 5(sup1): 79-83.
4. Carstensen L L, Erickson R J. Enhancing the social environments of elderly nursing home residents: are high rates of interaction enough?[J]. *Journal of applied behavior analysis*, 1986, 19(4): 349-355.
5. Chown S M. Friendship in old age[J]. *Personal relationships*, 1981, 2: 231-246.
6. Duncan-Myers A M, Huebner R A. Relationship between choice and quality of life among residents in long-term-care facilities[J]. *American Journal of Occupational Therapy*, 2000, 54(5): 504-508.
7. Gerbner G, Gross L, Signorielli N, et al. Aging with television: Images on television drama and conceptions of social reality[J]. *Journal of communication*, 1980, 30(1): 37-47.
8. Gerbner G, Gross L, Morgan M, et al. Living with television: The dynamics of the cultivation process[J]. *Perspectives on media effects*, 1986: 17-40.
9. Ice G H. Daily life in a nursing home: Has it changed in 25 years?[J]. *Journal of Aging Studies*, 2002, 16(4): 345-359.
10. Kipphan, H. *Handbook of Print Media* (Springer, Berlin, 2004).
11. Louho R, Kallioja M, Oittinen P. Factors affecting the use of hybrid media applications[J]. *Graphic arts in Finland*, 2006, 35(3): 11-21.
12. Lückenhoff C E, Carstensen L L. Socioemotional selectivity theory, aging, and health: The increasingly delicate balance between regulating emotions and making tough choices[J]. *Journal of personality*, 2004, 72(6): 1395-1424.
13. Mor V, Branco K, Fleishman J, et al. The structure of social engagement among nursing home residents[J]. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 1995, 50(1): P1-P8.
14. Mundorf N, Brownell W. Media preferences of older and younger adults[J]. *The Gerontologist*, 1990, 30(5): 685-691.
15. Monge P R, Contractor N S. *Theories of communication networks*[M]. Oxford University Press, USA, 2003.
16. Roloff M E. *Interpersonal communication: The social exchange approach*[M]. Sage Publications, Inc, 1981.
17. Rubinstein R I, Parmelee P A. Attachment to place and the representation of the life course by the elderly[M]//Place attachment. Springer, Boston, MA, 1992: 139-163.
18. Voelkl J E, Mathieu M A. Differences between depressed and non-depressed residents of nursing homes on measures of daily activity involvement and affect[J]. *Therapeutic Recreation Journal*, 1993.
19. Vandeboosch H, Eggermont S. Elderly people's media use: At the crossroads of personal and societal

developments[J]. COMMUNICATIONS-SANKT
AUGUSTIN THEN BERLIN-, 2002, 27(4): 437-456.