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Original Article

# An Investigation into the Home Transformation Needs of Older People with Dementia in China

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SUMMARY

*Background:* This study aimed to explore the needs of older people with dementia in terms of their home environment and how these needs are influenced by personal characteristics and the level of dysfunction.
*Methods:* A questionnaire survey was administered to 200 older people with dementia, in 10 communities of Ningbo, Zhejiang, China, between January and June 2019. Three questionnaires were used in this study.
*Results:* The factors influencing the participants' home transformation needs include level of dysfunction, age, monthly income, and living conditions (all $p < 0.05$). It was found that the participants' needs mainly consist of rest, supporting environment, and indoor activity space.
*Conclusions:* The needs of older people with dementia, with different degrees of dysfunction, vary and are influenced by several factors in the community. These findings provide a scientific basis for community-specific aging reforms.

## 1. Introduction

There are currently more than 35 million people diagnosed with dementia worldwide, and this number is expected to reach 120 million by 2050, according to Yao and Wang.[1] Dementia has gradually replaced stroke as the most common condition diagnosed in neuropsychiatric patients, and it is one of the most serious chronic diseases leading to loss of physical functions.

As defined by the National Aging Office, home-based care refers to the care provided to older people while living at home, rather than in a care facility. It is currently the most important mode of care in China.[2] Creating a home environment suitable for older people guarantees their safety, as well as the efficiency of home care services.[2] While this type of service seems ideal, the current overall living quality can no longer meet the needs of an aging population, especially for those diagnosed with dementia. Some of the existing housing problems for older people with dementia, include the lack of barrier-free access system devices, lack of elevators, unsuitable designs, space layouts, lack of auxiliary facilities in the bathroom space, lack of alarm assistance, and incomplete identification systems, among others.[3,4]

A number of studies[5−8] revealed that home improvements aimed at meeting the needs of older people can help prevent falls, delay functional decline, improve quality of life, and save the cost associated with the provision of care. Li Xiaoyun examined the environment planning strategies for elder-friendly communities, including residential units, open spaces, transportation features, service facilities, and old buildings suitable for renovation design.[9] Zhou Yanwei and Liu Jiayan assessed the suitability of existing residential areas for transformation for older people, by considering different perspectives, such as those of developers, designers, and buyers. Together with outdoor activity needs of older people, outdoor changes regarding the environmental design most suitable for this age group were proposed. These included different types of activity spaces, outdoor facilities, and garden elements.[10]

In some countries, home-based care services for older people value the importance of assessing and transforming the environment according to the needs of patients. According to studies conducted across various countries, the degree of transformation of the environment where older people live is determined by both objective and subjective factors. Objective factors refer to the material conditions of the environment, while subjective factors include individual behavior, life experience, and awareness of the living environment. Developed countries attach great importance to the problem of suitable accommodation in the home environment of their aging population. The cost of aging renovation in Sweden, Germany, Japan, and other countries, are also covered through state subsidies or insurance.[11–13]

In China, there is a shortage of professionals with the appropriate knowledge of home care services, rehabilitation, and architectural design. Also, few related studies exist, and the existing research and practice are mostly done from the perspective of the architects, who tend to target the older people group as a whole.[14] Therefore, there is a lack of personalized assessment scales to evaluate the individual differences in health status and ability level of older people.

The aim of this study was precisely to address the urgency in

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improving living conditions of older people with dementia, and to determine their needs regarding the transformation of their home environment, in 10 communities in Ningbo city. We also proposed to analyze the association of individual factors and level of dysfunction with the identified transformation needs. With this in mind, we designed a self-questionnaire, and evaluated its reliability and validity.

## 2. Materials and methods

### 2.1. Study design

A correlational cross-sectional design was adopted, using questionnaires for data collection.

### 2.2. Participants

A total of 200 older people diagnosed with dementia participated in the present study, between January and June 2019. The participants were identified and selected by convenience sampling who had been diagnosed by clinicians from 10 communities in five districts of Ningbo: Jiangbei District, Yinzhou District, Haishu District, Beilun District, and Zhenhai District. The samples from each district comprised 40 older people with dementia. A total of 200 questionnaires were distributed to the participants, with 175 valid questionnaires being included in the study.

The following inclusion criteria were used. Participants (a) were from local households, and older than 60 years of age; (b) met the diagnostic criteria for dementia (4th edition of the *American Diagnostic and Statistical Manual of Mental Disorders*), and had been diagnosed with *mild dementia* by clinicians; (c) had the ability to complete the questionnaires by themselves. The exclusion criteria were as follows. Participants (a) were unconscious; (b) had severe dementia; or (c) had impaired communication.

Multi-factor analysis methods were applied. According to relevant research, it was estimated that 18 variables may be entered into the model. A sample size of at least 10–15 times the variable was estimated. Consequently, 180 research subjects were required, and since the loss of follow-up rate is calculated at 10%, a sample size of around 200 people was required.

### 2.3. Data collection

Two investigators underwent unified training. The data were collected through face-to-face interviews at the participants' home. After we followed a meeting with the community service center managers, all the older people with dementia who participated in this study were included, according to their clinical diagnoses. The investigators explained the research objectives and methods, and obtained consent and cooperation from the participants who met the inclusion and exclusion criteria. Those who agreed to participate received an envelope containing the questionnaires. Participants completed the questionnaires immediately, and placed them in the envelope for collection by the investigators. To ensure anonymity, code numbers were placed on the completed questionnaires, after they were returned to the investigators.

### 2.4. Study measures

Three questionnaires were used in this study:
Personal Information Questionnaire for older people with dementia: this self-questionnaire includes demographics such as age, gender, marital status, education, monthly income, payment methods for medical expenses, living conditions, illness, and medication.

Activities of Daily Living Scale (ADL scale): this scale was developed by Lawton in 1969,[15] to determine the degree of dysfunction among older people with disabilities. Its Chinese version was subsequently validated by Tong & Man.[16] It consists of 14 items and uses a 4-point rating scale, ranging from "cannot do it yourself" to "can do it yourself." Scores range from 14 to 56, with high scores representing high levels of dysfunction. The Cronbach's $\alpha$ is 0.92 and the content validity is 0.86.

Older people with Dementia Adaptation Needs Questionnaire: this questionnaire was independently created by a research team. The indicators were collected by related references and experts' interview. The questionnaire comprises a total of 9 first-level indicators and 55 secondary indicators. The 9 first-level indicators are: entrances and exits (12 items), indoor activities (6 items), toilet (3 items), bathing (5 items), decoration (3 items), rest (5 items), preparation of meals (6 items), laundry (4 items), and supporting environment (11 items). Each item is scored according to a 5-point Likert scale, with scores ranging from 1 to 5 points. The higher the score, the higher the demand for transformation. The content validity of the questionnaire is 0.96 and the Cronbach's $\alpha$ is 0.98.

### 2.5. Data analysis

The statistical software, SPSS 22.0 was used to analyze the data. Data analysis after logic test was considered statistically significant ($p < 0.05$). The mean, standard deviation, frequency, and percentage were used to describe the demographic data, level of dysfunction, and the need for home environment transformation. The influence of demographic data and degree of dysfunction shown by the participants on the demand for suitable transformation was analyzed using multiple linear regression.

### 2.6. Ethical considerations

This study was approved by the Ningbo College of Health Sciences Ethics Committee (NBWY-031). All participants were included in this study following a meeting with the nursing homes and the community service center managers. Participants were informed that they had the right to withdraw at any time. Older people with dementia that consented, or were authorized, to take part, received the questionnaires. All participants were asked to place the questionnaires into an envelope for confidentiality, once completed. A code number was placed on each of the completed questionnaires by the investigators to ensure anonymity.

## 3. Results

A total of 200 questionnaires were distributed in this study, of which 188 were recovered (recovery rate of 94.0%), and 175 were identified as valid (effective rate of 93.1%).

Ninety-seven participants were female (55.4%) in 175 participants; aged 60–95 years old ($M = 72.18 \pm 6.88$); mostly married (58.3%) or widowed (37.2%), with the highest education level being junior high school and below (62.9%) and high school (20.0%). Most of the participants lived with their families (78.9%). Their monthly income ranged from 1001 yuan to 3000 yuan (64.0%), and medical expenses were paid mainly by urban medical insurance (48.0%) (Table 1).

The results from the Activities of Daily Living scale showed that the proportion of older people with dementia with mild dysfunction

was the largest (56.0%), followed by moderate (21.1%), very mild (12.6%), and finally severe (10.3%) (Table 2).

The Adaptation Needs Questionnaire revealed that older people with dementia prioritize rest needs (4.48 ± 0.81 points), supporting environment needs (4.47 ± 0.78 points), and indoor activity needs (4.44 ± 0.76 points) when it comes to their demand for transformation at home (Table 3).

Taking demographic data and patients' dysfunction as independent variables, the aging-reforming needs were divided into dependent variables for stepwise regression analysis using $p < 0.05$. The results showed that age, living conditions, monthly income, and degree of dysfunction are related to the needs for aging reform at home (Table 4 and Table 5).

## 4. Discussion

As the results demonstrated, the majority of older people with dementia who participated in this study displayed only mild symptoms. However, the proportion of dysfunction present in the participants (56.0%) in Ningbo city was higher than that found by other study (23.67%) in Shanghai city.[17] This can be due to several reasons. First, the annual disposable income per capita of older people is 69442 yuan (RMB) in Shanghai and 49899 yuan (RMB) in Ningbo. When the family's economic conditions are better, older people and their relatives have more options to choose from, with respect to medical institutions, and when dealing with various major diagnoses, better medical conditions can help reduce dysfunction-related diseases. Second, the patients' level of cultural literacy affect their health-related behaviors and health consciousness. If individuals have a strong sense of self-care, they can find ways of exercising it, seek medical treatment in time if there is a problem, and reduce the incidence of disability to a certain extent.

The results presented in Table 3 showed that the care needs of older people with dementia mainly consist of rest needs, supporting environment needs, and improvement of indoor activity spaces needs. Rest needs including: older people have supports when getting in and out of bed; it is convenient for the older people to switch the lights on the bed; and so on. Supporting environment needs in-

**Table 1**

Demographic data of older people with dementia (n = 175).

| Demographics | n | Percentage |
|---|---|---|
| Age | | |
| 60~ | 18 | 10.3 |
| 70~ | 51 | 29.1 |
| 80~ | 92 | 52.6 |
| 90~ | 14 | 8.0 |
| Gender | | |
| Male | 78 | 44.6 |
| Female | 97 | 55.4 |
| Marital status | | |
| Married | 102 | 58.3 |
| Widowed | 65 | 37.2 |
| Divorced | 8 | 5.0 |
| Education level | | |
| Junior high school and below | 110 | 62.9 |
| High school | 35 | 20.0 |
| College | 30 | 17.1 |
| Monthly income | | |
| ≤ 1000 yuan | 13 | 7.4 |
| 1001 yuan–3000 yuan | 112 | 64.0 |
| 3001 yuan–5000 yuan | 48 | 27.4 |
| > 5000 yuan | 2 | 1.2 |
| Payment method used to meet medical expenses | | |
| Public medical care | 43 | 24.6 |
| Town medical insurance | 84 | 48.0 |
| New rural cooperative medical care | 32 | 18.3 |
| Business insurance | 10 | 5.7 |
| Self-pay | 6 | 3.4 |
| Residence status | | |
| Living alone | 15 | 8.6 |
| Live with family | 138 | 78.9 |
| Live with a babysitter | 22 | 12.5 |

**Table 2**

The dysfunction status of older people with dementia (n = 175).

| Degree of dysfunction | Scores | n | Percentage |
|---|---|---|---|
| Extremely mild | 23.49 ± 1.87 | 22 | 12.6 |
| Mild | 33.49 ± 3.15 | 98 | 56.0 |
| Moderate | 41.38 ± 2.54 | 37 | 21.1 |
| Severe | 53.16 ± 1.95 | 18 | 10.3 |

**Table 3**

Detailed description of the aging transformation needs scale (n = 175).

| The scale and its sub-scale | Mean | Standard deviation | Score range | The number of items |
|---|---|---|---|---|
| Import and export demand | 4.29 | 0.71 | 1–5 | 12 |
| Indoor activity needs | 4.44 | 0.76 | 1–5 | 6 |
| Toilet needs | 4.41 | 0.79 | 1–5 | 3 |
| Bathing needs | 4.42 | 0.80 | 1–5 | 5 |
| Modifying needs | 4.41 | 0.88 | 1–5 | 3 |
| Rest needs | 4.48 | 0.81 | 1–5 | 5 |
| Meal needs | 4.40 | 0.86 | 1–5 | 6 |
| Laundry needs | 4.35 | 0.92 | 1–5 | 4 |
| Supporting environmental needs | 4.47 | 0.78 | 1–5 | 11 |
| Total scale | 26.84 | 4.59 | 9–45 | 550 |

**Table 5**

Factors affecting of aging transformation for older people with dementia.

| Variable | B | Beta | t | p |
|---|---|---|---|---|
| Age | 4.55 | 0.20 | 4.86 | .003 |
| Living situation | 3.09 | 0.08 | 2.76 | .038 |
| Monthly income | 3.76 | 0.19 | 4.98 | .006 |
| Degree of dysfunction | 8.79 | 0.51 | 7.99 | .005 |
| Gender | 28.02 | 26.53 | 1.06 | .301 |
| Marital status | 1.89 | 7.81 | 0.24 | .811 |
| Education | 10.47 | 16.21 | 0.65 | .524 |
| Payment methods for medical expenses | 6.92 | 6.89 | 1.01 | .325 |

**Table 4**

Assignment method regarding the independent variables of factors influencing the aging transformation for older people with dementia.

| Item | Assigning value |
|---|---|
| Age | 60~ years old = 1; 70~ years old = 2; 80~ years old = 3; 90~ years old = 4 |
| Gender | Female = 0; male = 1 |
| Marital status | Take other marital status as reference |
| Education level | Junior high school and below = 1; High school = 2; college= 3 |
| Monthly income | ≤ 1000 yuan = 1; 1001 yuan–3000 yuan = 2; 3001 yuan–5000 yuan = 3; > 5000 yuan = 4 |
| Payment method used to meet medical expenses | With other payment method as reference |
| Residence status | With other residence conditions as reference |

cluding: convenient opening and closing curtains or windows; the switch installation position of the indoor light is appropriate; there is a one-key alarm device for older people in accidents such as falls at home, and so on. Improvement of indoor activity spaces needs including: there is a seat or support at the door for the older people when changing shoes; convenient opening and closing the doors in each room; no water or dampness in the bathroom, kitchen, balcony to prevent the older people from slipping, and so on. Individuals with mild symptoms, generally have the ability to take care of themselves and engage in daily activities, reducing their dependence on others. Thus, there is a high demand for the transformation of the supporting environment, and a wider and safer indoor activity space, where older people with dementia can maintain a certain degree of independency, while making use of appropriate at-home aides. For instance, if the lights could be switched on and off from the bed, older people could see the indoor environment clearly. Also, phones and doorbells with loud tones, non-slip floors to prevent falls, handrails and alarms in the toilet and bathroom to get help when they lose their balance or fall, could be provided. This is consistent with the findings of other studies.[18–20]

Furthermore, studies by Pynoos et al.[5] and Liu and Lapane[6] found that older people's home environment is very important to improve their quality of life. A survey of 400 healthy older people showed that 47.7% of the respondents believed that the it is necessary. The statistical analysis of the factors that affect the willingness to reform is significantly related to age.[21] Similarly, in a survey conducted by Han on 123 healthy older people, 30.9% of the respondents were eager to have changes made to their home environment. The main areas identified as suitable for improvement included: (1) Ground: the entrance, exit, and passageway are barrier-free; the ground height difference is eliminated; the wheelchair access space is guaranteed; and the ground is non-slip; (2) Walls: install handrails and safety grab bars; (3) Toilet: install handrails and grab bars on basins, toilets, and showers; install safety bath stools or bath chairs in the bathtub; and install toilet chairs in place of pit-type toilets; (4) Other items: emergency call facilities installed in toilets and on bedsides.[22] A study involving 150 healthy older people showed that the details of the installation of handrails and anti-slip measures, have a strong correlation with their existing housing needs. It is fundamental to carry out the necessary transformations in accordance with the actual situation of the individual.[23] In addition, the adaptation of the home environment can also help delay the functional decline associated with dementia, and save the costs linked with the provision of care. Therefore, home care services should consider the need for assessment and transformation of the home environment. Close attention and strong support from the government and relevant personnel would contribute greatly to this end.

It can be inferred from the standardized regression coefficients in Table 4 and Table 5 that older people with dementia's needs for environment reform and transformation, are impacted by their level of dysfunction, age, monthly income, and living status (in that order, from large to small impact). In other words, the more severe the dysfunction, the greater the need for home modification to meet the needs of the individual.

Results also indicated that the older the individual, the higher the need for a suitable home environment. Indeed, with the increase of age, the function of various organs declines, overall resistance decreases, and individuals become more susceptible to various chronic diseases. There are also many complications associated with aging, such as a slow recovery, poor health, and the decrease of daily living, communication, and social participation capabilities. Housing reforms would facilitate older people's daily lives and reduce risk

factors. This is consistent with studies conducted by Wu, Liu, and Yu[24] which also showed that as older people age, the need for age-appropriate remodeling increases.

Moreover, it was found that monthly income also impacts the ability to carry out suitable transformations at home. As a consequence of various diseases, older people's health can deteriorate, and thus their ability to perform daily activities. Families with a more favorable economic situation, are often willing to transform the home, to meet the older people's needs. In fact, similar studies to Wu's in 2017 have shown that older people with higher monthly incomes have a stronger willingness to reform their homes. However, this can be challenging for those with a single source of income or lower incomes.[24]

The findings also revealed that older people who live alone have a higher demand for a suitable home transformation. In contrast, older people living with their relatives have sufficient informal care and, therefore, lower needs for such transformations. This is consistent with an aforementioned study, which showed that older people who do not live with their children, are more willing to reform their home environments than the those who live with their children.

With the development of society, childless and young children families, have been increasing, resulting in a serious shortage of informal care, and the problem of long-term care for older people living alone has become increasingly prominent. Therefore, it is suggested that the government, or the relevant departments, strengthen their policy guidance, in order to help older people living alone, by supporting suitable transformations in their homes, and to improve their quality of life, given that they are the ones who need it the most.

## 5. Limitations and further research

There are some limitations to this study. First, a convenience sample was used. Second, the participants were from the South of China only, which led to a limited degree of generalizability of the findings. Therefore, future research should strive to explore the needs of home transformation for older people with dementia, especially through a cohort study, and inclusion of a more diverse and representative sample.

## 6. Conclusion

Research on the aging of the home environment has just started in China, and the home transformation is very important to improve the quality of life of older people with dementia. The results showed that the care needs of this population mainly consist of rest, supporting environments, and indoor activities. Also, the individuals' levels of dysfunction, age, monthly income, and living status are the factors that mostly predict the need for transformation at home. These findings provide a scientific basis for future age-appropriate community reconstruction services, for older people diagnosed with dementia.

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## Conflict of interest

The authors declare that they have no conflict of interest.

## Authors' contributions

Author 1: conception, design, analysis, and data interpretation, manuscript drafting, manuscript revision, and final approval.

Author 2: data acquisition, project administration, manuscript revision, and final approval.

Author 3: formal analysis, manuscript revision, and final approval.

Author 4: conception, manuscript revision, and final approval.

Author 5: conception, design, funding acquisition, manuscript revision, and final approval.

All authors read and approved the final manuscript.

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