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# Research on the Present Situation of Barrier-free Renovation of Disabled Families

## -- A Case Study of Wuhan

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## Abstract

**Based on the importance of Barrier-free home reconstruction for the disabled, the present situation and demand of Barrier-free home reconstruction for the disabled in Wuhan were studied through questionnaire survey and descriptive statistics. Through the analysis of all 458 samples, it is found that disabled families have a large demand for personalized and intelligent household products, while the Barrier-free facilities level of these two items in the actual reconstruction is very low, and there are also problems in maintenance supervision and policy advocacy. In this paper, countermeasures are put forward for the family Barrier-free reconstruction in China. Through the popularization of safety and emergency knowledge, the promotion of smart home, the strengthening of quality supervision and post-maintenance, and extensive publicity, the quality of life of persons with disabilities has been improved to meet their needs for home rehabilitation and realize people's yearning for a better life.**

## Keywords

**The Disabled; Family Barrier-free Reconstruction; Smart Home; Supervision.**

## 1. Research Background

As the main unit for the survival and development of the disabled, family has a close relationship with the quality of life and rehabilitation of the disabled. Studies have shown that a sound Barrier-free home environment helps to expand the scope of daily activities of persons with disabilities and improve their self-care ability, thereby reducing the burden on families and society and increasing social integration [1]. However, the needs of the disabled are often ignored in the design of most of the home environment in China, which does not have universality. As a result, the needs of home rehabilitation of this huge group cannot be met, and their daily life is inconvenient, which makes it difficult to improve their quality of life and even face security risks. According to a survey of the environment safety detection rate (assessment of detection of risk factors in different functional areas of the home environment by going into the home) of the disabled at home, the detection rate of environmental risk factors of the disabled family is much higher than that of children and the elderly at home. Poor safety conditions lead to a significantly higher fall rate of disabled people at home than that of able-bodied people of the same age[2]. Therefore, accelerating the construction of Barrier-free facilities for families with disabilities and creating a Barrier-free social environment are still an important task for the current work of the disabled.

However, due to the late start[3], poor content, depth and mandatory aspects of the relevant laws and regulations[4], vague and poorly implemented accessibility laws and regulations[5], and many other problems, the development of Barrier-free construction of disabled families in China is slow, and it is difficult to meet the needs of disabled people's home life in practice. Therefore, this study is expected to analyze the needs of disabled people for Barrier-free home

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environment and the present situation and deficiency of Barrier-free home reconstruction by conducting a questionnaire survey on disabled families in Wuhan, to provide feasible suggestions for Barrier-free home reconstruction in China, and provide more convenient, comfortable, happy, independent and free home life for the disabled now and later.

## 2. Research Design

### 2.1. Research Methods

In this study, quantitative research method is followed, and questionnaire survey is used to explore the core problems in the practice of Barrier-free reconstruction of disabled families. In consideration of the diversity of families with disabilities, two sets of questionnaires are designed in this survey to investigate the situation and satisfaction of the disabled families in Wuhan, Hubei Province who have been renovated for Barrier-free housing, and the needs of the disabled families included in the renovation plan but not yet renovated for Barrier-free housing. In terms of data processing, Excel was used to input data and SPSS 23.0 was used for descriptive statistics.

### 2.2. Sample Selection

In order to ensure the representativeness of the sample, the multi-stage random sampling method was adopted according to the information on the disabled from Wuhan Disabled Persons' Federation. In the first stage, the sampling unit was district (county, city), and random sampling method was used to select two central urban areas and two remote urban areas in Wuhan; the sampling units for the second stage were streets; the sampling unit of the third stage were individual samples. The respondents are the disabled in Wuchang District, Qiaokou District, Jiangxia District and Caidian District of Wuhan City. The official investigation period was from late March 2021 to early May 2021. A total of 250 questionnaires were distributed on the needs of disabled families in Wuhan for Barrier-free reconstruction, and 256 were valid, with an effective recovery rate of 97.66%; a total of 211 questionnaires were distributed about the Barrier-free reconstruction of families with disabilities in Wuhan, and 208 were valid, with an effective recovery rate of 98.58%.

## 3. Research Results

### 3.1. There is an Obvious Demand for Personalized and Intelligent Barrier-free Facilities

The survey results show that 40.4% of disabled people think it is most necessary to install furniture products suitable for disabled people in their living space, accounting for nearly half, followed by Barrier-free design, accounting for 18%. In addition, 0.8% and 10% of disabled people believe that the introduction of intelligent equipment and reasonable allocation of room space are also necessary conditions for their accessibility to life.

As for the existing Barrier-free renovation of disabled families, the survey results show that 32.8% of disabled people agree with the importance of installing handrails in toilets and bathrooms, 20% agree with the benefits of replacing squat toilets with toilets, 26% agree with the necessity of improving the operating environment in kitchens, and 24.8% agree with the installation of non-slip floors. In addition, the construction of Barrier-free access and the increase of intelligent equipment also accounted for a high proportion, reaching 22.8% and 20% respectively.

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**Table 1.** Necessary Conditions in Living Space for People with Disabilities

| Necessary Conditions in Living Space | Number of Families | Proportion (%) |
|---|---|---|
| Household products for persons with disabilities | 101 | 40.40 |
| Barrier-free design of space | 45 | 18.00 |
| Introduction of intelligent devices | 27 | 10.80 |
| Reasonable room area allocation | 25 | 10.00 |
| Total | 198 | / |

**Table 2.** Home Barrier-free Facilities Considered Most Useful by People with Disabilities

| Modification Demands | Number of Families | Proportion (%) |
|---|---|---|
| Increase of toilet armrest | 82 | 32.80 |
| Improvements to kitchen operations | 65 | 26.00 |
| Installation of non-slip floor | 62 | 24.80 |
| Construction of Barrier-free passage and ramp | 57 | 22.80 |
| Squat toilet into a toilet | 50 | 20.00 |
| Additions to intelligent settings on electrical appliances | 50 | 20.00 |
| Additions to handrails in interior corridors | 39 | 15.60 |
| Retrofitting of emergency help call button | 38 | 15.20 |
| Installation of Barrier-free lifting platform | 23 | 9.20 |
| Installation of Barrier-free flat sliding doors and sliding doors | 22 | 8.80 |
| Retrofitting of protective walls and corners | 20 | 8.00 |
| Modification of furniture dimensions, placement or use | 11 | 4.40 |
| Total | 519 | / |

## 3.2. Insufficient Demand and Funds are the Main Reasons Why There is Demand but no Transformation

The survey results show that 56.8 % of the disabled do not intend to carry out family accessibility transformation, accounting for more than half. The main reasons are no need and insufficient fund. According to the data, 54.93% of disabled people think that they can take care of themselves in the common home environment, 23.24% of disabled people are accustomed to activities without Barrier-free facilities, and 29.58% of disabled people think that their families do not have enough funds to bear the cost of Barrier-free reconstruction, and 3.52% had never heard of the Barrier-free reconstruction.

**Table 3.** Reasons for Barrier-free Family Transformation of Disabled People

| Reasons for Reconstruction | Number of Families | Proportion (%) |
|---|---|---|
| They can take care of themselves in the common home environment | 78 | 54.93 |
| Their families do not have enough funds to bear the cost of Barrier-free transformation | 42 | 29.58 |
| Used to moving around without accessibility, so no transformations are needed | 33 | 23.24 |
| There is less need for Barrier-free transformation because of the care of others | 17 | 11.97 |
| They find the application and renovation process troublesome | 9 | 6.34 |
| Never heard of the Barrier-free reconstruction | 5 | 3.52 |
| Total | 184 | / |

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## 3.3. The Main Way to Learn about this Policy

### 3.3.1. Families that have Undergone Rehabilitation have Learned about the Policy Mainly Through the Community, the Disabled Persons' Federation and the Government

On the whole, 42.79% of the disabled who have carried out Barrier-free transformation at home are very familiar with the policy of Barrier-free transformation at home in Wuhan, only 3.85% are not familiar with relevant policies, and 0.48% are not at all clear about it. From the perspective of the channels for the disabled families to know about the accessibility reform policy, nearly 80% of respondents learned about relevant policies through community workers, the Disabled Persons' Federation or government propaganda, and only 6.76% learned about relevant policies through TV, Internet and other media. Some disabled people learned about relevant policies through publicity from relatives and friends, medical rehabilitation institutions or other means.

**Table 4.** Level of Understanding of Relevant Policies among Disabled People Who Have Undergone Barrier-free Transformation of Families

| Level of Understanding | Number of Families | Proportion (%) |
|---|---|---|
| Very well | 89 | 42.79 |
| Have a better understanding | 68 | 32.69 |
| General | 42 | 20.19 |
| Know little | 8 | 3.85 |
| Know nothing | 1 | 0.48 |
| Total | 208 | / |

### 3.3.2. Families without Reconstruction have Low Awareness of Policies, and Their Understanding Channels Depend on Government Departments

**Table 5.** Level of Understanding of Relevant Policies among Disabled People Who Haven't Undergone Barrier-free Transformation of Families

| Level of Understanding | Number of Families | Proportion (%) |
|---|---|---|
| Very well | 81 | 32.40 |
| Have a better understanding | 55 | 22.00 |
| General | 66 | 26.40 |
| Know little | 29 | 11.60 |
| Know nothing | 19 | 7.60 |
| Total | 250 | / |

According to the data, the disabled people who have not carried out the family Barrier-free transformation have obviously lower awareness of relevant policies than the disabled people who have carried out the Barrier-free transformation. Among the respondents who have not carried out the Barrier-free reform, 32.4% are very familiar with the Barrier-free reform policy in Wuhan, 22% are relatively familiar with it, and 26.4% have a moderate understanding of it. In terms of access to information about the policy, 70% of disabled persons learned about it

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through publicity of community workers, 21.6% through publicity of the CDPF or the government, and 0.8% through friends, relatives and the media.

## 3.4. The Overall Transformation Rate is Lower in Households that have Carried out Barrier-free Transformation

The data of this survey show that 39.42% of the interviewees believe that they have obstacles in the use of bath appliances in their home life, accounting for the highest proportion of all kinds of obstacles; second, the barriers of entering and leaving the door, walking indoors and using household appliances, accounting for 16.35% and 11.54% respectively; besides, 10.1% of respondents also found difficulties in kitchen operation.

The projects and types of Barrier-free renovation for disabled families mainly focus on the following three aspects: in terms of the toilet in the housing, 58.17% of the disabled had their homes renovated with non-slip floor, handrails and shower devices, and 47.12% had installed Barrier-free toilets and lavatories; in terms of Barrier-free access and walking, 23.56% of disabled people installed handrails between rooms in their homes, and 12.02% made flat changes to entrances and exits or changed ramps at the bottom of buildings; as for the kitchen, 15.87%t of the households with disabilities have been renovated with low operating tables and low water buckets, and 18.75% have been equipped with special kitchen appliances, such as flashing alarm kettles designed for the hearing disabled. In contrast to the urgent need for accessible restrooms, doorways and kitchens, only 2.88% of persons with disabilities have a need for accessible emergency assistance equipment, and 3.85% of households with persons with disabilities have special emergency call devices installed in their homes.

**Table 6.** Contents of Barrier-free Reconstruction for Disabled Families

| Reconstruction Item | Number of Families | Proportion (%) |
|---|---|---|
| Non-slip floor, handrail, shower unit | 121 | 58.17 |
| Barrier-free toilet, wash basin | 98 | 47.12 |
| Barrier-free access and handrails between rooms | 49 | 23.56 |
| Special kitchen appliances | 39 | 18.75 |
| Low operating table, low water bucket | 33 | 15.87 |
| Leveling or slope of the entrance and exit passageway of housing | 25 | 12.02 |
| Flash doorbell or video doorbell | 19 | 9.13 |
| Voice intercom doorbell | 9 | 4.33 |
| Emergency calling device | 8 | 3.85 |
| Lifting clothes rack | 7 | 3.37 |
| Total | 408 | / |

## 3.5. Regular Maintenance Rate and Obstacle Repair Rate are Low

The situation of regular home inspection is generally good. 65.38% of the respondents said that after quality problems occur, professional personnel often inspect the Barrier-free facilities in their homes, and only 10.1% of the respondents said that there are no or few professional personnel to visit the Barrier-free facilities. Only 18.18% of respondents reported to the Disabled Persons' Federation or the street office for repair when Barrier-free facilities broke

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down, and no respondents chose to contact the original manufacturer for repair; more than 30% of the respondents repaired by themselves through other channels; nearly 20% of respondents said they would not make any repairs to the accessibility facilities if they had some quality problems but could continue to be used reluctantly.

**Table 7.** Frequency of Visits by Professionals to Inspect Accessibility Facilities

| Maintenance Frequency | Number of Families | Proportion (%) |
|---|---|---|
| Always | 42 | 20.19 |
| Often | 94 | 45.19 |
| Occasionally | 51 | 24.52 |
| Seldom | 11 | 5.29 |
| Never | 10 | 4.81 |
| Total | 208 | / |

## 4. Analysis of Barrier-free Reconstruction of Disabled Families

### 4.1. Neglect of Safety Emergency Device Modification

The transformation project of the operation of passage, kitchen and toilet is the most common and routine, and its development is relatively optimistic, and there are targeted transformation of electric furniture such as kettle, doorbell, coat hanger, but the popularity and demand of emergency call rescue device is still very low, ranked at the end of the transformation. People with disabilities have varying degrees of physical dysfunction, such as partial loss of visual, auditory, tactile and other cognitive abilities, which will reduce their flexibility in responding to external stimuli. As a result, they are more likely to fall, knock, electric shock, burns, gas poisoning, disease and other accidents. So the importance of emergency call buttons, smoke alarms, gas leak alarms, automatic power failure devices to them is self-evident. Although some persons with disabilities are cared for by family members or carers in their daily lives, unforeseen events can have devastating consequences when a danger occurs and they are unable to seek help and timely assistance from relatives or members of the community.

In accordance with the other provisions of "Barrier-free Housing and Dormitories" in Article 3.12.4 of the People's Republic of China standard *Barrier-free Design Code (GB50763-2012)*, a call button for help should be set up in the bedroom and bathroom. The neglect of the necessity of an emergency help button actually reflects the lack of a comprehensive cognition of the concept of accessibility represented by the safety emergency awareness by the vast majority of persons with disabilities and CDPF staff. People with disabilities often think that Barrier-free reconstruction can only meet the needs of daily life, and there is no need to pay attention to safety emergency measures; the CDPF staff also failed to do a good job in the assessment and did not remind the disabled of the importance of installing safety emergency devices, so that they had little awareness of the implementation of the comprehensive transformation of Barrier-free facilities.

### 4.2. The Transformation Degree of Individuation and Intelligence is Low

With the gradual improvement of people's living standards, the disabled group also has new requirements for the quality of personal life, with a new comprehension and expectation for independence and freedom. Traditional universal Barrier-free facilities are not practical, safe and convenient enough to fully meet the increasingly diversified life demands of the disabled. Traditional furniture or products are relatively independent, but the activities of people with

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disabilities in their homes throughout the day are a coherent process, so the interaction between people and the environment needs to be considered as a whole. The concept of "smart furniture" has been upgraded to "smart home". The intelligent Barrier-free facilities based on the platform of living space are a collection of products and applications in the intelligent management system, including furniture control system, lighting control system, electrical control system, security monitoring system, etc.

Disabled people live at home for a longer time, and their dependence on the family environment is higher, so the intelligent indoor Barrier-free facilities are particularly important for them. When the existing Barrier-free facilities cannot meet their daily needs, many families with disabilities will decorate or reorganize their private space by themselves, equip themselves with auxiliary products and purchase smart home products as a further supplement. Personalized and intelligent customization will gradually become the mainstream choice of Barrier-free family environment construction. Smart home can improve the convenience, comfort and safety of the life of the disabled, and one-to-one personalized design can also allow users to obtain better advantages, to achieve both environmental protection and energy saving home life.

### 4.3. Lack of Initiative and Effectiveness in Maintaining Supervision

About a quarter of respondents believe that the lack of effective supervision and maintenance is one of the most important problems in the construction of family Barrier-free environment. On the whole, most of the interviewees are satisfied with the daily inspection and management work of the staff of the CDPF. However, when the barrierless facilities in their homes break down or are damaged, the interviewees seldom take the initiative to report to the CDPF or the street office for repair, resulting in serious passivity in supervision and maintenance.

Lack of professional maintenance will lead to low utilization rate of facilities, which will not give full play to their use efficiency. However, due to the concern about the long procedure and slow feedback of applying for repair from the street offices and the Disabled Persons' Federation, more disabled families adopt the following two methods to deal with the failure of Barrier-free facilities: first, self-maintenance through other channels, which can not avoid the uneven quality of maintenance; second, as long as they can continue to use it reluctantly, they will not maintain it, which will bring greater safety risks to the disabled families, such as poor circuit contact, loose parts, parts defects and other "small problems" in the eyes of respondents.

### 4.4. Inadequate Policy Advocacy and Communication Results in Low Public Awareness

The process of policy communication is an important link that affects the effective implementation of policy. However, for China's current family Barrier-free reconstruction policy, there are not only few publicity channels, but also the policy communication work carried out through the existing channels has not been implemented practically, resulting in the known information can not play its due role.

First, nearly half of the respondents acknowledged that advocacy by the community and CDPF staff or the government was the main channel through which they learned about the policy, but at the same time, they feel that their families do not have enough funds to bear the cost of Barrier-free reconstruction, or feel that the application process is troublesome, and some have not even heard of Barrier-free reconstruction. Such phenomenon shows that when relatives and friends are unable to provide information on the policy, the staff of the community, the Disabled Persons' Federation or the government have not fully considered the actual situation of the disabled, let alone helped the disabled and their families to truly understand the content of the policy, resulting in the unsatisfactory communication effect of the policy. Due to the lack of detailed interpretation of the policy by the staff, many families with disabilities do not know

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the details of the policy, such as the government's free provision of Barrier-free reconstruction, the subsidy standard, the materials they need to prepare, and how to handle the application procedures, which worries and troubles them to a large extent.

Second, medical rehabilitation institutions, which are frequently visited by the disabled, have not assumed the responsibility of being the main body of policy publicity. Since the ultimate goal of rehabilitation training or auxiliary tools is to achieve Barrier-free living conditions for the disabled, it is also a reflection of the responsibility of medical rehabilitation institutions to actively publicize relevant policies on Barrier-free environment construction.

Finally, the absence of television, Internet and other media in the process of policy advocacy shows that people are far from paying enough attention to the accessibility of families with disabilities in a broader social environment beyond the daily lives of persons with disabilities. Traditional media have a low frequency of thematic reports on the work of persons with disabilities in family accessibility rehabilitation policies, rehabilitation processes and outcomes. Even though some online channels have been established, for example, local disabled persons' federations publish policy information on their websites, not every family with a disability has the means and ability to access these documents on their own.

## 5. Optimization Countermeasures for Barrier-free Reconstruction of Disabled Families

### 5.1. Popularize Emergency Knowledge of Home Safety for Persons with Disabilities and Install Emergency Assistance Devices

According to relevant research, injuries at home are not unique to people with disabilities. Therefore, in order to ensure that the disabled can seek help in time when they meet emergency situations at home, it is necessary for the disabled people's Federation and relevant government departments to install emergency help devices for them during the Barrier-free reconstruction. In addition to the security work during the specific transformation, the transformation object should also have the cognition of the concept of home safety emergency. The main body of the transformation should strengthen the publicity and popularization of the concept of accessibility. When formulating the transformation policy or plan, the knowledge of home safety emergency should be added in the text, and the related concepts should be introduced to the families of the disabled.

### 5.2. Advocate Universal Design Concept and Develop and Promote Smart Home Products

The original intention of universal design is to serve all users. The hope of this concept is to achieve a relatively perfect design by taking into account the use environment and psychological needs of all users [6]. There is a complementary special relationship between Barrier-free design and universal design, in which the former is mainly for the disabled, the elderly, children and other special groups, in order to facilitate their life and work, while the latter is for a wider range of objects, all kinds of social groups, with more comprehensive way of design thinking expressed. Therefore, the current mainstream view is that in order to make the disabled better adapt to the home environment and break the environmental barriers to ensure the safety of their home life, home products with universal design concept should be encouraged.

Furthermore, with the progress of society and the enrichment of material life, the emergence of intelligent products begins to help people create a more comfortable and better world. With computers, networks, integrated cabling, by a total system that integrates systems through an information platform, smart home can create a more comfortable, convenient, fast and environmentally friendly living environment. Intelligent home furnishing is the inevitable

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result of social development [7]. Through modern technological means, smart home products can make up for part of the physical defects of the disabled to a certain extent, help them overcome difficulties in daily living or operating tools, so that they can realize self-care in the home environment. Therefore, it is necessary to combine the Barrier-free transformation of disabled families with smart home products, encourage the research and development of smart products, and actively promote the popularization of smart home, so as to solve the problems in the home life of disabled people.

### 5.3. The Quality Supervision and Maintenance of Barrier-free Facilities should be Strengthened

The survey of this study shows that there are not many families with disabilities who have repaired through the channels of disabled federations and relevant government departments after the Barrier-free transformation of their families. However, the Barrier-free facilities they have repaired at their own expense have encountered many problems when they are used again. Therefore, in the whole process of family Barrier-free reconstruction, relevant departments need to take their own responsibilities to do a good job in the quality supervision, regular inspection and maintenance of facilities.

In the early stage of the Barrier-free reconstruction of disabled families, the reconstruction plan should be tailored to the disabled families according to the actual situation of the disabled and the reconstruction needs of the disabled people counted by the CDPF in the household evaluation. Disabled persons' federations at all levels should strengthen communication with housing and urban and rural construction departments and take the initiative to provide them with information related to the needs of disabled families for Barrier-free reconstruction, so as to identify the Barrier-free facilities suitable for the families to be renovated. After the selection of reconstruction households, the housing and urban and rural construction departments shall, in light of the actual situation of families with different categories of people with disabilities, implement personalized family Barrier-free reconstruction schemes in accordance with the relevant state regulations and the requirements of Barrier-free design standards, and the quality and overall design of Barrier-free facilities shall meet the standards. Upon the implementation and completion of the renovation project, the municipal disabled federations shall organize household inspections and supervise the renovation work throughout the whole process with the residential construction department in order to ensure quality. The facilities that fail to be inspected shall be rectified within a time limit, and the provincial disabled federations shall conduct supervision and inspection of the renovation work in due time.

### 5.4. Extensive Publicity to Promote Social Attention to Barrier-free Home Environment Construction

Because China has not yet formed a sound Barrier-free environment system, many citizens and even the disabled themselves pay limited attention to the construction of Barrier-free environment. Therefore, the government should strengthen the publicity of relevant policies and concepts, and urge the Disabled Persons' Federation, rehabilitation institutions, communities and the media to publicize more policies and knowledge of Barrier-free family environment. Professional policy advisory services should be provided to the disabled and their families in need to help them better obtain support from relevant policies. Meanwhile, the public should be given correct guidance and appeal to citizens to pay attention to the construction of Barrier-free environment, so as to deepen their understanding of Barrier-free environment. Only in this way can the equal rights and interests of disabled persons to participate in social life and enjoy the fruits of social development be better guaranteed, so as to eliminate the obstacles they face in daily life.

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