Research Report

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The Disablement Process among Elderly Chinese

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ABSTRACT

The purpose of this study is to determine whether the Disablement Process (DP) model is supported by data from a large survey of elderly Chinese ages 65-105 years old (the Chinese Longitudinal Healthy Longevity Survey). It is expected that, as described by the DP model and earlier models, functional limitations will mediate the relationship between impairments and disability (measured via activities of daily living). The main point of interest is whether an intra-individual factor (a subjective sense of social isolation, or loneliness) and an extra-individual factor (adequate medical care) moderate the disablement process among this sample of elderly Chinese. Findings (a) support prior research showing the relative importance of lower- (versus upper-) body functional limitations for ADL disability, (b) suggest the indirect importance of both adequate medical care and of reported loneliness for levels of ADL disability, and (c) demonstrate that hypertension has direct effect, in addition to indirect effects, on levels of ADL disability. Future in-depth investigation of factors that mitigate and exacerbate later-life disablement in Chinese contexts is necessary and important.
INTRODUCTION

Research on the disablement process among Chinese elderly is important for two reasons. First, China is home to a rapidly aging population of elders that surpasses 100 million in number (Feng and Xiao 2007). Clearer understanding of later-life disablement processes in this society would contribute to the effectiveness of interventions designed to reduce current and future rates (and levels) of disability. Secondly, the disablement process has been studied mostly in the context of Western developed nations. To the extent that we understand disability as, at least partly, a social condition -- that is, as the difference between environmental demand and individual ability -- and that we view disablement as a social process, it makes sense to suspect that pathways of disablement may differ across social contexts. On the other hand, it may be that a single model of the disablement process applies across social settings, and that only prevalence rates or the particular factors that promote or hinder disability vary. Findings from research on disablement processes in a Chinese context are therefore theoretically, as well as practically, significant.

Following similar studies conducted on data from the United States and other developed nations, (Peek et al. 2005; Lawrence and Jette 1996), this paper asks whether the Disablement Process (DP) model is supported in data from a study of elderly Chinese ages 65-105 years old. It is expected that, as described by the DP and earlier models, functional limitations will mediate the relationship between impairments and disability. The main point of interest is whether, as the DP model would suggest, intra-individual and extra-individual factors moderate disability among this sample of elderly Chinese. The paper begins with a brief review of the conceptual model, existing research, and a description of the Chinese context. A discussion of the results and of the observed associations between risk factors, functional limitations, and intra-/extra-individual factors concludes the paper.

The Disablement Process Model and its Components

The Disablement Process model (Verbrugge and Jette 1994) (DP) posits that disease and impairments lead to functional limitations which in turn result in disability (see Figure 1). Functional limitations are here defined as restrictions in physical or mental actions; for example, walking, standing, bending, or grasping items. Disability is defined as the gap between expectations and ability to fulfill those expectations; that is, as difficulty acting “in necessary, usual, expected and personally desired ways in [one’s] society” (Verbrugge and Jette 1994). In other words, a functional limitation need not be a disability unless the environment requires the ability to complete that particular physical or mental action. Defining disability in this manner allows us to understand disability as a sociological, not only a physiological, condition. The DP model adds to prior conceptualization of disablement (Nagi 1976) by arguing that intra-individual factors (e.g., psychosocial attributes and behaviors) and external conditions
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(medications and technologies, and built environment) can promote or deter disablement and the speed of the process (see Figure 1). Although the argument is appealing, more empirical research is needed to lend support to this key proposition. Should the moderating role of intra-individual and extra-individual factors be solidly demonstrated by research, it will be important to theorize whether and how these factors differ across socio-cultural and political contexts.

Lawrence and Jette’s (1996) study was the first to empirically test the DP Model. Using three waves of the Longitudinal Study of Aging (LSOA) they found that lower-extremity functional limitations, more so than upper-extremity functional limitations, were significantly and directly related to IADL disability. Results from this research suggest that lifestyle does not directly affect disability, but rather, that behaviors such as lack of physical activity affect disability through their influence on functional limitations.

Other studies in Western developed societies have lent general support for the DP model but also raise additional questions and points for future investigation. They suggest that future research examine not only the influence of intra- and extra-individual factors along the disablement pathway, but also the relative importance of lower- vs. upper-body limitations, the potential direct effects of pathologies/impairments on disability, and the possibility that disease-specific variations might exist in the disablement pathway. Femia et al (2001)’s Swedish study found support for a strong link between lower body functional limitations and disability, and also for the significant role of intra- and extra-individual factors (depression and social integration) on the severity of disability. Peek et al. (2005) examined the process of disablement among a sample of older Mexican-Americans and found that only (lower body) functional limitations, but not socio-demographic characteristics or the intra-individual factor of emotional support had direct effects on ADL disability. One pathology, diabetes, was found to have a direct (as well as direct) effect on disability. Other researchers have proposed detailed and comprehensive models of disablement specific to rheumatoid arthritis (Escalante and Rincon 2002) and dementia (Barberger-Gateau 2004) which may or may not be applicable to other chronic illnesses. Another area in need of exploration is the potential for ethnic/racial variation in the pathway from disease to disability.

Results from research by Zsembik et al. (2000) suggest that the DP model may better explain disability for some racial/ethnic groups than for others, and that the periods most crucial in the disablement process may vary by socio-cultural groups as well. Perhaps just as likely are socio-cultural (that is, inter- as well as intra-national) differences in the extent to which the DP model adequately describes the process(es) of disablement. Socio-cultural environments may not only shape expectations (environmental demands) of and for later-life experience (Levy and Langer 1994) but also actual physical abilities. This study contributes to research on later-life disability by examining the applicability of the DP model among a sample of elderly people in China.
Disablement and Chinese Elderly

China’s population is rapidly aging and is projected to be one of the world’s oldest populations by 2050 (Poston & Zeng 2008). Improvement in Chinese population health during the last century raised life expectancy and sharply decreased mortality rates (Banister 2004). As in other settings, a growing number of elderly people is expected to increase rates of impairments and disability ((Moran, Lv, & Chen 2008; Wang et al. 2005). After adjusting for socio-demographic factors, oldest-old Chinese report less general ADL disability than do the US oldest-old, although the very oldest Chinese (90 years and older) have difficulty with eating and toileting to a greater extent than do American elders of the same age group (Moran, Lv, and Chen 2008). However, this higher rate of difficulty is likely due to differences in physical conditions and cultural practices (i.e., floor toilets and the standard use of chopsticks).

Using data from the Chinese Longitudinal Healthy Longevity Survey (CLHLS), Zeng et al. (2002) show that on the whole, ability to perform activities of daily living (ADL) begins to decline rapidly around age 80, and particularly after age 85. Women report more difficulty in performing ADL tasks compared to men, and the urban elderly are disadvantaged in terms of ADL performance. Because living conditions, socio-economic status, and health care is generally poorer in China’s rural areas compared to urban centers, it may come as a surprise that rural elders report higher ADL scores. However, a rural advantage can be at least partly explained by Clarke and George’s (2005) finding that particular characteristics of built environment, namely greater land-use diversity, act as a deterrent to disability in later-life. It is likely that Chinese rural elders have relatively more opportunities to walk and perform outdoor leisure- and farming activities, as well as greater likelihoods of having engaged in physical labor over their life course, than do their urban peers. Zimmer and Kwong (2004), using measures of self-care and chronic disease, also find that urban elders report more functional limitations than do rural counterparts. Still, there is some conflicting evidence regarding the rural advantage in ADL scores (Tang et al. 2002; Tang et al. 1999), and additional research on China’s urban-rural differences in later-life disability is needed.

METHOD

Data

This paper uses data from two waves (2002, 2005) of the Chinese Longitudinal Healthy Longevity Study (CLHLS). The CLHLS is a longitudinal study of Chinese elderly ages 65 and above that was conducted with the goal of determining social, behavioral, biological, and environmental factors that shape healthy longevity in the People’s Republic of China. Although a more complex analysis would be possible by using three or four waves of the study, I restrict
the present analysis to the two waves that include people ages 65-79\(^1\) because (a) a fair amount of disability occurs among younger-old Chinese, and (b) including only the oldest-old in the study increases the chances of the sample being biased from prior mortality selection. The analytic sample is therefore comprised of respondents age 65-105 who were alive and not lost-to-follow-up at Time 2 (2005) and who reported no disability at baseline (2002). \(^2\) The resulting analytic sample size is 6,256 after reserving an additional hold-out sample of 500 (for sensitivity analyses).

**Measures**

**Disability.** The dependent variable is constructed as a three-point ordinal variable based on a modified version of the Katz ADL Scale (Nagi 1979). Respondents were asked at Time 2 (2005) if they needed help doing, or were unable to do, the following six tasks: bathing, dressing, toileting, transferring, remaining continent, or feeding. If needing help or unable to do one of these tasks, they received a score of 1 to indicate the presence of disability. These dichotomous variables were summed for an ADL summary measure of between 0 and 6. This method of measuring disability has been used in similar studies (Peek et al. 2005; Jette and Lawrence 1996). Due to a highly skewed distribution, the variable was collapsed into three categories (coded: 0 to indicate no disability, 1 to indicate a report of one ADL disability, and 2 to indicate a report of two or more ADL disabilities).

**Pathologies/impairments.** Pathologies are here defined as “biochemical and physiological abnormalities that are detected and medically labeled as disease” (Verbrugge and Jette 1994:3). Impairments, defined as dysfunctions and structural abnormalities, are often used to evaluate the severity of pathologies, which may in fact be “deeply interior” conditions (ibid). In other words, impairments could in some cases be understood as secondary conditions, or as manifestations of pathologies that might otherwise remain hidden. Although conceptually distinct, this study categorizes pathologies and impairments together. This approach has precedent and should not compromise the conclusions of the present study which focuses mainly on determining whether intra- and extra-individual factors act as moderators along the path between disease and disability (Peek et al. 2005; Lawrence and Jette 1996).

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\(^1\) The 1998 and 2000 waves interviewed only elders ages 80 and above; ages 65-79 were not included until the 2002 wave.

\(^2\) I do this to follow a prior study (Peek et al. 2005) and because the disablement process may begin relatively earlier for many elderly (i.e., between ages 65 and 79). The assumption is that the process of disablement that decedents experienced did not systematically differ from that of their surviving (or lost) counterparts. Disability is a condition that most people “live with, not die from” (Verbrugge and Jette 1994).
The presence of pathologies/impairments was ascertained by respondents’ answers to whether or not they were “suffering from any of the following”: Heart disease, high blood pressure, stroke, arthritis, respiratory disease, cataracts, and diabetes. Notably, this measure is not determined by whether the elderly person had received a professional diagnosis, and it is especially appropriate for rural and disadvantaged respondents whose opportunities to access health care may be limited. Visual impairment was assessed by an objective test and hearing impairment was reported by the interviewer.

**Functional limitations.** Measures of functional limitations are categorized into upper-body functional limitations and lower body functional limitations. Prior studies suggest that lower-body (rather than upper-body) functional limitations are of primary importance along the path from health to disability (Guralnik et al. 1995; Lawrence and Jette 1996). Lower-body functional limitations were assessed based upon respondents’ ability (a) to stand from a chair and (b) to turn 360 degrees while standing. The interviewer was asked if the respondent was able to perform these tasks without help. If the respondent was unable to do so, or needed assistance in performing either of these tasks, the respondent received a score of 1, indicating the presence of lower-body functional limitations. Upper-body functional limitations were assessed based upon respondents’ ability (a) to put each hand behind their neck and (b) to put each hand behind their lower back. If the respondent was unable to do so with either hand, or needed assistance in performing either of these tasks with either hand, the respondent received a score of 1, indicating the presence of upper-body functional limitations.

**Risk factors.** Risk factors are age (continuous), sex (female = 0/1), marital status (married = 0/1), education (0/1; having or not having any years of formal education), current urban residence (urban = 0/1), and perceived adequacy of finances. The answer (yes or no) to the question “Does all of your financial support sufficiently pay your daily costs?” was used to determine perceived adequacy of finances. In order to most closely replicate a similar study (Peek et al. 2005), health behaviors (smoking, drinking, and exercising) are not included in this initial investigation. Unfortunately, information on body mass index (BMI) is not available for the 2000 wave of data.

**Intra-individual and Extra-individual Factors**

Prior studies have demonstrated positive associations between disability, disease, and social isolation (Hopps et al. 2001, Jones, Victor, and Vetter 1985, Rokach, Lechcier-Kimel, & Safarov 2009; Paul, Ayis, and Ebrahim 2006, Weinstein and Ventry 2002), although the links have yet to be explicated. On one hand, disablement may promote social isolation due both to mobility challenges (e.g., opportunities to socialize) and to influences on psychological health and opportunities to relate to others (Long & Martin 2000, Savikko et al. 2005, Luanaigh &

Social isolation of elderly people has recently been posited as potential social problem in China, especially in rural areas due to high rates of junior family members’ migration to cities (Yang and Victor 2008; Liu and Guo 2007). However, the general literature on social isolation suggests that objective measures of social isolation (such as the size and extent of social networks or the frequency of contact with other people) may be less effective predictors of health outcomes than are subjective experiences or perceptions of social isolation – that is, loneliness (Cacioppo et al. 2009, Cole et al. 2007, Hawkley et al. 2006, Weinstein and Ventry 2002, Pennix et al., 1997, Seeman 2000, Sugisawa et al. 1994). The feeling of being “alone in the crowd” may be likely even in large, multi-generation households -- common in China-- in which rapid social change has fostered large “generation gaps.” It would be particularly important in these settings to assess subjective, rather than objective, social isolation. For these reasons, this study is interested in the extent to which the intra-individual factor of perceived social isolation, or “loneliness,” moderates the path between pathology/impairments and disability. Loneliness is measured as a dichotomous variable according to whether the respondent reported being “never” or “seldom” lonely (coded 0) or “sometimes,” “often,” or “always” lonely (coded 1).

In addition to suggesting the importance of intra-individual factors in shaping disability, the disablement models posits that external conditions may act as moderating (that is, either promoting or deterring) factors in the disablement process. Access to health care has been already been shown to be an important factor influencing general health outcomes (Andrulis 1998, Andersen 1994). In China, providing access to quality health care in rural areas continues to be a main challenge for the government, and privatization of medical care is resulting in growing inequalities in access in urban areas as well (Liu et al. 1999; Blumenthal and Hsiao 2005). In this study, the extent to which elders report being able to access quality health care is expected to reduce levels of ADL disability insofar as they would be able to receive preventative treatment as well as access to technologies and tools such as daily living helps, hearing aids, eyeglasses, etc. Access to adequate medical care was assessed (0/1) based on respondents’ answer to the question: “Can you get adequate medical service when you are seriously ill?”

**Analytic Strategy**

I estimate structural equation models to seek general evidence that the main pathway from pathology to disability works through functional limitations and to test the hypotheses that
(a) an intra-individual factor of perceived social isolation (frequency of loneliness) and (b) an extra-individual factor of availability of adequate medical care moderate ADL disability among a sample of Chinese elderly. I use *Mplus* software and begin by offering descriptive results and presenting results related to the links between risk factors, pathologies/impairments, and intra-/extra-individual factors.

The main model is one in which functional limitations at baseline (2002) – but *not* pathologies/impairments – directly affect disability at Time 2 (2005). All risk factors are allowed to directly influence disability at Time 2 (2005), pathologies/impairments, functional limitations, and intra-/extra-individual factors. This decision diverges slightly from prior studies, in which only the risk factors of age and sex are allowed to directly affect other components in the disablement process. Due to vagueness in terms of how the DP model posits intra- and extra-individual factors to moderate disability, intra- and extra-individual factors are also allowed to directly affect disability at Time 2. I then conduct Sobel (1982) tests to examine whether the indirect effects of pathologies/impairments through both upper-body functional limitations and through lower-body functional limitations are statistically significant (p< .05). After estimating the main model, and to check for the possibility of direct effects of pathologies/impairments on disability, I follow Peek et al. (2005), and I estimate a model in which pathologies/impairments are also allow to directly affect ADL disability level.

In order to assess whether loneliness and adequate medical care (both at 2002) moderate disability at 2005, I use the DIFFTEST command in Mplus and examine whether parameters can be equated across groups (eg, lonely and non-lonely, inadequate and adequate medical care). Statistically significant results would indicate that the unrestricted model fits better and that significant group differences exist.

Goodness-of-fit is determined through standard measures (McDonald and Ho 2002) of root mean square error of approximation (RMSEA), which is considered acceptable if .05 or below (Schumacker & Lomax, 2004: 82; Hu and Bentler 1999), the comparative fit index (CFI), which by convention is hoped to be greater than .90 (meaning that 90 percent of the covariation in the data can be reproduced by given model), and the Tucker-Lewis Index (TLI), which indicates a better fit as it approaches the value 1.

Findings suggesting that the effects of pathologies/impairments on ADL disability are mainly indirect, working through functional limitations, will lend support for this most fundamental aspect of the DP model in this sample of Chinese elderly people. In addition, significant group differences between “lonely” and “not lonely” groups, and between groups with and without that adequate medical care will support the model’s main argument of interest; that intra-individual and/or extra-individual factors moderate (i.e., mitigate or exacerbate) disablement.
RESULTS

Table 1 shows the sample characteristics for respondents who reported no ADL disability at the 2002 baseline wave (N=6,256). Because sex differences in disability and chronic disease are common, results are categorized by gender. The pathologies/impairments most common among women are vision impairment, arthritis, hearing impairment, and hypertension. Men generally report lower rates of pathologies/impairments than do women, with the most common being arthritis, high blood pressure, respiratory disease, and hearing and vision impairments. Prevalence of upper body (2.44 percent) and lower body (14.01 percent) functional limitations among women are roughly double those for men (1.04 and 7.87 percent, respectively) in this sample.

A smaller portion of women than men report being “seldom” or “never” lonely (66.99 percent versus 89.91 percent), and a comparable percentage of women and men report having adequate access to medical services when seriously ill (89.31 and 92.19 percent, respectively). Sociodemographic characteristics by gender also follow expected patterns, with women reporting being slightly older, less often married, and less educated than male counterparts. At wave two, the overall percentage of ADL disablement is greater for women (17.67 percent) than for men (11.98 percent).

The other tables show results from the structural equation model for level of ADL disability. Table 2 shows Mplus results for estimating relationships between risk-factors, each of the pathologies/impairments, and the intra-individual and extra-individual factors in 2002. Age is positively related to being hearing impaired, visually impaired, and having cataracts, but shows a negative relationship with most of the other pathologies/impairments. Keeping in mind that respondents’ ages range from 65-105, this result may reflect a “robustness” of the respondents who are living until ages 90 and higher. Being female is positively related to all pathologies/impairments except for hearing impairments, stroke, and respiratory disease.

Urban residence is positively associated with heart disease, stroke, diabetes, hypertension, and cataracts but shows negative associations with hearing and visual impairments. Reporting adequate financial conditions is negatively associated with the presence of stroke, arthritis, respiratory disease, and hearing and visual impairments. Being older, married, educated, urban, and having adequate finances are negatively associated with loneliness. There is a relatively large and significant association between having adequate finances and having adequate medical services, while being urban, married and younger show significant positive relationships with reporting adequate medical services.
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Directs Effects on Disability

Table 3 shows the direct effects of risk factors, pathologies/impairments, and intra-and extra-individual factors and functional limitations on ADL disability at Time 2. The goodness-of-fit statistics indicate that model fits only marginally well, and suggests the need to explore alternative models. As in prior studies, there are significant positive direct effects of age on ADL disability levels. However, urban residence is also significantly, however slightly, associated with increased ADL disability levels. Neither the intra-individual factor (frequency of loneliness) nor extra-individual factor (adequate medical services) had significant direct effects on ADL disability. According to the Disablement Process model, functional limitations, but not pathologies or impairments, will have direct effects on ADL disablement. Because other factors (all risk factors and intra-/extra-individual factors) were allowed to directly affect disability in this model and therefore may not test the DP model most precisely, another model was estimated that did not allow for direct effects of risk factors (besides age) or other factors on disability. The model fit did not improve (results not shown).

In terms of other links in factors along the path to disability, being older, less educated, and reporting inadequate financial conditions are positively related to lower body functional limitations. Heart disease, stroke, hypertension, hearing impairments, and visual impairments are significantly associated with lower body functional limitations while only hearing impairments and visual impairments are significantly associated with upper body functional limitations.

Indirect Effects of Pathologies/Impairments on Disability

The indirect effects of pathologies/impairments and socio-demographic characteristics were further investigated using the Sobel (1982) test of mediation. Although relatively more sophisticated bootstrapping techniques for such a test of mediation are now commonly preferred, the Sobel (1982) test is warranted here due to the large sample size and categorical variables. Sobel tests suggest that heart, stroke, hypertension, hearing impairment, visual impairment, age, education, and adequate finances exert significant indirect effects on ADL disability via lower body functional limitations. Only hearing impairment and visual impairment exert statistically significant indirect effects via upper body functional limitations (see Table 3, bolded numbers).

Effects of Intra-and Extra-individual Factors

Although intra- and extra-individual factors had no significant direct effects on ADL disability, they appear to have important implications for ADL disability level, indirectly (Table 3). Notably, results from the model and the Sobel tests suggest that adequate medical services have a significant indirect effect on ADL disability through association with both lower- and
upper-body functional limitations. The Sobel test also indicates statistically significant but slight negative indirect effects of seldom/never being lonely on ADL disability level via its association with lower-body functional limitations.

Results from tests of group difference show that having adequate medical care provides no significant moderating effect on disability. However, a slight but statistically significant group difference was found between elders reporting being seldom/never lonely and others, suggesting a difference in the disablement process between these two groups. A closer look at the results suggest differences both in terms of the links between risk factors and pathologies/impairments and the links between functional limitations and disability. Somewhat counter-intuitively, upper-body functional limitations have a positive direct effect on levels of disability only among those never or seldom lonely, but not for others. Explanations for this finding, as well as a more adequate general understanding of the relationships between social relationships and disability in China requires additional and in-depth research in the Chinese context and is an important direction for future research. The author is currently launching a longitudinal qualitative study that will investigate this general theme.

**Additional Analyses**

As noted by Peek et al. (2005), the hypothesized disablement model has been criticized insofar as the only factor usually estimated for direct effects on disability is lower body limitations, while the possibility of direct effects of other factors, and of the importance of upper-body functional limitations, are relatively overlooked. As indicated above, the main model in this paper allows for direct effects of socio-demographic characteristics (risk factors) on disability and also includes measures of upper-body limitations. In addition, another model, which also estimated direct effects of pathologies/impairments, was examined (results not shown). When both impairments/pathologies and functional limitations are included in the model, no direct effects of pathologies/impairments are significant with the exception of hypertension. Hypertension appears to have a significant, direct effect on ADL disability above and beyond its influence on lower-body functional limitations.

Finally, because of vast differences in built conditions, life chances, and everyday life in rural and urban Chinese areas, I tested for rural-urban differences in the disablement process. Insofar as disablement is a social process related to the demands of environment and society, it is also reasonable to suspect that gender may not only be an important “pre-disposing” factor, but also a life-long status that shapes the pathway to disability. Results from conducting multiple-group comparisons in Mplus indicated no significant differences by urban-rural residence. The same test shows no significant differences by gender.
DISCUSSION

The aim of this paper was to test the extent to which the Disablement Process (DP) model (Verbrugge and Jette 1994) is supported among this sample of elders ages 65-105. Results provide only marginal support for this model. The intra-individual factor of subjective social isolation (i.e., loneliness), and the extra-individual factor of adequate medical care appear to exert some influence on the process of disablement. Significant effects of several pathologies were found to influence ADL disability level through lower-body functional limitations, while findings show significant indirect effects of hearing impairment and visual impairment via upper-body functional limitations. Additionally, results suggest that hypertension, above and beyond its association with lower-body functional limitations, has direct effects on ADL disability among these Chinese elders. This finding adds to research showing the need for additional attention to the causes and consequences of hypertension among elderly Chinese.

While path analysis indicates areas for future exploration, relatively more in-depth research is needed in order to clarify the role of these factors in the disablement process among Chinese elders and to expand our theoretical understandings of later-life disablement. An important direction in which the model may be further expanded is to consider the relative costs of the potential moderating factors and to consider from a sociological perspective the distribution of these costs. While it is expensive for government to improve access to quality health care, the long-term expense to families and government of relatively higher levels of ADL disability may be greater. Finally, the potential for social isolation to exacerbate ADL disability among elderly Chinese is an important area for future investigation and should be of particular interest in the context of rural China, where rapid social change may isolate elderly people – even those living in large households – and where rates of temporary (but long-term) migration of junior family members continue to increase. This research can also lay the groundwork for future comparative work that will help to build cross-cultural theories of links between later-life disability and social relationships.

Limitations

This study suffers from a number of limitations. First, there are a number of other variables that might be advisable to include in the model. I have elected to start by loosely replicating Peek et al. (2005) and Lawrence and Jette (1996) and following their precedent in most regards. Additionally, the measurement and conceptualization of the components of disablement process might be improved. It may be most consistent with other studies – although not necessarily most wise -- to measure functional limitations by using data from the survey questions “Can you walk continuously for 1 km” or ‘Can you crouch and stand three times repeatedly?’ Also, the study employs only two waves of data, although data from the CLHLS includes four waves over a seven-year period. I sacrificed the ability to analyze more than two
waves in order to capture the “young-old” in my study. Because of this decision, risk factors, pathologies/impairments, and functional limitations are all measured at the same wave. This practice mimics the analyses in Lawrence and Jette (1996) and Peek et al. (2005) but has major shortcomings in terms of understanding causality. Finally, it should be acknowledged that other measures of ADL disability may be more appropriate for China than the ones included in the study and based upon the Katz ADL (Ikels 1991). Additional and ground-level research in Chinese contexts would be helpful in order to improve measurement of disability and to identify potential mediating and moderating factors in the path from health to disability in China.

**CONCLUSION**

In China as well as many other contexts, increasing rates of later-life disability not only affect elderly populations but also exert effects throughout the society. Knowledge of disablement processes in China is important both for scholars and policy makers interested in the health and well-being of Chinese elders and for building cross-cultural theories of later-life disablement. This study represents a preliminary step toward understanding and reducing later-life chronic disease and disablement among older adults in China. Findings lend only marginal support for the Disablement Process model and suggest the need for additional, in-depth study of later-life disablement in China.
REFERENCES


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**Figure 1.** A Model of the Disablement Process
Verbrugge and Jette (1994)

**Extra-Individual Factors**
- Medical care and rehabilitation
- Medications and other therapeutic regimens
- External supports
- Built, physical, and social environment

**The Main Pathway**

- **Pathology** → **Impairments** → **Functional Limitations** → **Disability**

**Risk Factors**

**Intra-individual Factors**
- Life-styles and behavior changes
- Psychosocial attributes and coping
- Activity accommodations
### Table 1. Characteristics of Sample for Respondents with No ADL Disability at Baseline, By Gender

<table>
<thead>
<tr>
<th>Pathology/Impairments</th>
<th>Women</th>
<th>Men</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Heart disease</td>
<td>8.01</td>
<td>7.13</td>
</tr>
<tr>
<td>% High blood pressure</td>
<td>15.96</td>
<td>14.30</td>
</tr>
<tr>
<td>% Stroke</td>
<td>3.01</td>
<td>3.80</td>
</tr>
<tr>
<td>% Arthritis</td>
<td>20.92</td>
<td>15.71</td>
</tr>
<tr>
<td>% Respiratory disease</td>
<td>9.10</td>
<td>14.27</td>
</tr>
<tr>
<td>% Cataracts</td>
<td>9.81</td>
<td>7.34</td>
</tr>
<tr>
<td>% Diabetes</td>
<td>2.10</td>
<td>1.51</td>
</tr>
<tr>
<td>% Vision impairment</td>
<td>21.78</td>
<td>12.48</td>
</tr>
<tr>
<td>% Hearing impairment</td>
<td>17.20</td>
<td>11.24</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Functional Limitations</th>
<th>Women</th>
<th>Men</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Upper body limitations</td>
<td>2.44</td>
<td>1.04</td>
</tr>
<tr>
<td>% Lower body limitations</td>
<td>14.01</td>
<td>7.87</td>
</tr>
</tbody>
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<tr>
<th>Intra-individual Factor</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Proportion reporting seldom or never lonely:</td>
<td>66.99</td>
<td>75.89</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Extra-individual Factor</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Proportion reporting adequate medical services when seriously ill:</td>
<td>89.31</td>
<td>92.19</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Risk Factors</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age (years)</td>
<td>81.20</td>
<td>79.00</td>
</tr>
<tr>
<td>% Married</td>
<td>28.65</td>
<td>58.31</td>
</tr>
<tr>
<td>% No education</td>
<td>79.84</td>
<td>30.84</td>
</tr>
<tr>
<td>% Urban</td>
<td>16.84</td>
<td>18.27</td>
</tr>
<tr>
<td>% Reporting insufficient finances</td>
<td>21.39</td>
<td>17.91</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Disability at Time 2&lt;sup&gt;b&lt;/sup&gt;</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent with 0 ADL limitations</td>
<td>81.73</td>
<td>88.02</td>
</tr>
<tr>
<td>Percent with 1 ADL limitation</td>
<td>7.67</td>
<td>5.42</td>
</tr>
<tr>
<td>Percent with 2+ ADL limitations</td>
<td>10.60</td>
<td>6.56</td>
</tr>
</tbody>
</table>

*Source: CLHLS 2002-2005*
Table 2. Main pathway structural parameter estimates for the disablement process: Standardized coefficient estimates for the relationships among risk factors and pathology/impairments at baseline (N=6233)\textsuperscript{a, b, c}

<table>
<thead>
<tr>
<th>Risk Factors</th>
<th>Pathologies/Impairments</th>
<th>Intra-I Factor</th>
<th>Extra-I Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Heart</td>
<td>Stroke</td>
<td>Arthritis</td>
</tr>
<tr>
<td>Age</td>
<td>0.012</td>
<td>-0.114</td>
<td>-0.108</td>
</tr>
<tr>
<td>Female</td>
<td>0.106</td>
<td>ns</td>
<td>0.105</td>
</tr>
<tr>
<td>Married</td>
<td>0.051</td>
<td>0.070</td>
<td>ns</td>
</tr>
<tr>
<td>Education</td>
<td>0.107</td>
<td>ns</td>
<td>ns</td>
</tr>
<tr>
<td>Urban</td>
<td>0.184</td>
<td>0.074</td>
<td>ns</td>
</tr>
<tr>
<td>Adequate Finances</td>
<td>ns</td>
<td>-0.086</td>
<td>-0.119</td>
</tr>
</tbody>
</table>

Note: for model fit statistics, see Table 3
--- Parameter not included in the equation
ns: parameter not significant at the p<0.05 level
\textsuperscript{a} Estimated with WLSMV (Mplus)
\textsuperscript{b} Standardized coefficients presented (standard error)
\textsuperscript{c} Direct “effects” presented
Table 3. Standardized coefficients for the relationships between risk factors, pathologies/impairments, and other factors in 2002 and ADL disability in 2005 - direct effects (N=6233)

<table>
<thead>
<tr>
<th>Functional Limitations</th>
<th>Lower Body</th>
<th>Upper Body</th>
<th>ADL Disability</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Functional Limitations</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower Body</td>
<td>----</td>
<td>----</td>
<td>0.14</td>
</tr>
<tr>
<td>Upper Body</td>
<td>----</td>
<td>----</td>
<td>0.17</td>
</tr>
<tr>
<td><strong>Pathology/Impairment</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heart</td>
<td>0.15</td>
<td>ns</td>
<td>----</td>
</tr>
<tr>
<td>Stroke</td>
<td>0.13</td>
<td>0.17</td>
<td>----</td>
</tr>
<tr>
<td>Arthritis</td>
<td>ns</td>
<td>0.11</td>
<td>----</td>
</tr>
<tr>
<td>Diabetes</td>
<td>ns</td>
<td>0.26</td>
<td>----</td>
</tr>
<tr>
<td>Hypertension</td>
<td>0.12</td>
<td>ns</td>
<td>----</td>
</tr>
<tr>
<td>Cataract</td>
<td>ns</td>
<td>ns</td>
<td>----</td>
</tr>
<tr>
<td>Respiratory disease</td>
<td>ns</td>
<td>0.12</td>
<td>----</td>
</tr>
<tr>
<td>Hearing Impairment</td>
<td>0.21</td>
<td>0.24</td>
<td>----</td>
</tr>
<tr>
<td>Visual Impairment</td>
<td>0.25</td>
<td>0.22</td>
<td>----</td>
</tr>
<tr>
<td><strong>Intra-individual Factor</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loneliness</td>
<td>-0.08</td>
<td>-0.11</td>
<td>ns</td>
</tr>
<tr>
<td><strong>Extra-individual Factor</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adequate medical services</td>
<td>-0.11</td>
<td>-0.20</td>
<td>ns</td>
</tr>
<tr>
<td><strong>Risk Factors</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>0.12</td>
<td>ns</td>
<td>0.42</td>
</tr>
<tr>
<td>Female</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
</tr>
<tr>
<td>Education</td>
<td>-0.08</td>
<td>ns</td>
<td>ns</td>
</tr>
<tr>
<td>Married</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
</tr>
<tr>
<td>Urban</td>
<td>ns</td>
<td>ns</td>
<td>0.08</td>
</tr>
<tr>
<td>Enough</td>
<td>0.07</td>
<td>ns</td>
<td>ns</td>
</tr>
</tbody>
</table>

RMSEA = .05  
Chi-square = 1052.539/57 df  
CFI = 0.73

--- Parameter not included in the equation  
ns: parameter not significant at the p<0.05 level  
a Estimated with WLSMV  
b Standardized coefficients presented (standard error)  
c Direct effects presented  
**Bolded** indicates significant indirect effects (per Sobel 1982 test) at p<.05 level
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