Rising or Declining? Trends of Disability and Functional Limitation under Different Measurements in Chinese Older Adults

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The indices of Activity of Daily Life (ADL) and instrumental ADL (IADL) have been routinely applied in the current disability trend studies. This study reviewed the use of ADL and IADL in disability studies, and analyzed trends of disability and functional limitation in the Chinese elderly population over 65 from 2002 to 2008 by using four measurements that are chosen to indicate different combinations of etiological pathways in the disablement model: 1) the self-reported dependency in doing ADL, 2) the self-reported difficulty in independently performing IADL, 3) the Nagi self-evaluated difficulty in physical functioning, and 4) the performance-based functional limitation. Under these four measurement schemes, we detected contrasting temporal changes in disability and functional limitations in Chinese older adults. The ADL or IADL-based disability trends had significant declines among Chinese elders from 2002 to 2008; however, these elders meanwhile had worse functional performances if observed objectively. The observed improvement in ADL and IADL could thus be largely due to substantial improvement in environment, facility and social support of daily lives of the Chinese elders instead of better physiological functioning. As disability trends based on ADL and IADL measures essentially indicate temporal changes of a mixture of disability components, both intrinsic and external, we call for a caution for health practitioners and policymakers when they apply these disability trends to infer changes of intrinsic functional health of older adults. This issue might be particularly relevant for developing societies, where rapid socioeconomic transformations may make disability trends more sensitive to contextual rather than intrinsic factors of disability.

1. Introduction

In the current literature of disability trends, index of Activity of Daily Life (ADL) and instrumental ADL (IADL) are routinely used.

schemes, chosen to reflect different combinations of etiological pathways in the disability model. As shown in Table 1, these measurement schemes have different affiliations with the physiological pathway, psychological pathway, environmental pathway (i.e., infrastructure, facility, and assistive technology), and social pathway (i.e., human assistance):

1) The self-reported dependency in performing ADL activities: the elder was asked if he/she needs any personal assistance in ADL activities. Such a measurement reflects a broad range of pathways in the disablement model, physiological, psychological, environmental, and social;
2) The self-reported difficulty in performing IADL activities independently: the respondent was asked about any difficulties in doing IADL activities independently. As the questions check scenarios of independence where no personal assistance is present, the social pathway is ruled out;
3) The Nagi style of self-evaluated functional limitation: the elder reported his/her functional capacity in accomplishing certain function tasks in a respondent-assumed general situation. As these questions capture context-free self-evaluations on functioning, both environmental and social pathways are excluded, but not the psychological pathway;
4) The performance-based functional limitation: an interviewer objectively examines performance of the respondent in a series of functioning tests. This measurement only reflect physiological pathways of disability. Besides comparing trends under the four measurement schemes, we additionally examine how the observed ADL and IADL disability trends, measurements of which are with the most etiological pathways in the disability model, could be possibly explained by physiological, psychological, medical, sociodemographic, and life-history factors.

Table 1: Four Types of Disability Measurements

	Intrinsic dimension		External dimension	
	Physiological pathway	Psychological pathway	Environmental pathway	Social pathway
Self-reported dependency in ADL	×	×	×	×
Self-reported difficulty in IADL, independently	×	×	×	
Nagi style of self-evaluated functional limitation	×	×		
Performance-based functional limitation	×			

2. Method

Data

The data are from the Chinese Longitudinal Healthy Longevity Survey (CLHLS). The CLHLS is a national-wade survey of the Chinese elderly population, conducted in randomly-selected halves of the counties/cities in 22 out of the 31 provinces in China. In this study, we used the 2002, 2005 and 2008 waves of the CLHLS, which totally contained 45,567 observations of Chinese older adults aged 65 and over with 15,069 in 2002, 14,939 in 2005 and 15,559 in 2008.

Measurement of Disability and Functional Limitations

For the self-reported dependency of ADL, the CLHLS asked whether a respondent needs any assistance from others in bathing, dressing, indoor transferring, toileting, and eating. For each specific activity, the need of any personal assistance was coded as 1 otherwise 0; and individuals reporting dependency at one or more of these activities were considered as ADL dependent. For the self-reported difficulty in doing IADL independently, the respondent was asked whether he/she has

difficulty in independently conducting the following activities such as using public transportation, doing laundry, shopping, cooking meal and visiting neighborhood. Any reported difficulty was coded as 1 otherwise 0 for each IADL item; and any difficulty in one or more of these items was considered to have difficulty in doing IADL independently. The Nagi style of self-evaluated difficulty in physical functioning was measured through three questions, which asked respondents to report if they have difficulty in continuously crouching for 3 times, lifting 5 kilograms, and walking for 1 kilometer without a stop. Any reported difficulty was coded as 1 otherwise 0 for each item; and any difficulty in one or more of the three items was considered to have difficulty in functioning. Last, three performance-based tests were conducted to measure the performance-based functional limitation. In these tests, respondents were asked to stand up from chair without using hands, pick up a book from floor, and turn around 360 degrees. Any observed failures in performing the task was coded as 1 otherwise 0; and any failure in one or more of the three tests was considered to be functionally limited in performance-based tests.

3. Results

Table 2: Odds Ratios of Disability and Functional Limitation in 2005 and 2008 by Gender and Rural/Urban Residence in Reference to 2002

	Total		Gender				Residence			
			Females		Males		Rural		Urban	
	2005	2008	2005	2008	2005	2008	2005	2008	2005	2008
ADL	**0.79*** **	**0.49*** **	**0.79*** **	**0.47*** **	**0.80** **	**0.52*** **	**0.74*** **	**0.46*** **	**0.84** **	**0.51*** **
Bathing	0.86***	0.52***	0.86**	0.51***	0.86*	0.54***	0.80***	0.49***	0.91	0.54***
Dressing	1.08	0.79***	1.06	0.76***	1.13	0.87	1.02	0.73***	1.14	0.85
Toileting	1.03	0.73***	1.00	0.70***	1.12	0.80*	0.98	0.67***	1.08	0.80**
Transferring	1.09	0.84**	1.03	0.81**	1.21	0.93	1.03	0.79***	1.13	0.90
Eating	1.04	0.84**	1.04	0.77***	1.05	1.01	0.95	0.72***	1.17	1.02
IADL	**1.00**	**0.80*** **	**0.93**	**0.75*** **	**1.07**	**0.86** **	**0.91***	**0.77*** **	**1.14***	**0.84** **
Transportation	1.05	0.96	1.00	0.86**	1.12*	1.10	1.00	0.93	1.14*	1.01
Laundry	1.08*	0.85***	1.08	0.84***	1.09	0.85**	1.00	0.78***	1.22***	0.91
Shopping	1.03	0.88**	0.96	0.75***	1.15*	1.11	0.97	0.84***	1.12	0.91
Cooking	1.10*	0.95	1.08	0.90*	1.13*	1.02	1.04	0.89*	1.18**	1.00
Neighbor Visiting	1.18***	0.96	1.15**	0.88*	1.26**	1.12	1.12*	0.92	1.26***	0.97
Nagi Measures	**1.00**	**0.96**	**0.90***	**0.81*** **	**1.13***	**1.12***	**0.95**	**0.95**	**1.07**	**0.95**
Crouching	1.10**	1.04	1.06	0.96	1.15**	1.16**	1.07	0.98	1.15**	1.12*
Lifting	1.00	0.94	0.99	0.91*	1.00	0.99	0.96	0.90**	1.04	1.00
Walking	1.02	1.01	0.98	0.90*	1.10	1.16**	0.98	1.01	1.08	0.98
Performance Tests	**1.07***	**1.12*** **	**1.07**	**1.10***	**1.07**	**1.15** **	**1.01**	**1.11** **	**1.16** **	**1.13***
Standing up	1.02	1.03	1.01	1.01	1.05	1.06	0.98	1.06	1.09	0.97
Picking Book	1.14***	1.15***	1.13**	1.17***	1.16**	1.11*	1.09*	1.15**	1.20***	1.11
Turning around	1.04	1.46***	1.05	1.43***	1.05	1.51***	0.96	1.43***	1.17**	1.50***

Note: Results are adjusted for age, gender, ethnicity, rural/urban residence and the proxy reporting. *$*p<0.05$ $**p<0.01$ $***p<0.001$*

The disability odds ratios in 2005 and 2008 in reference to the year of 2002, adjusted for demographics and proxy reporting, were summarized in Table 2. Dependency in ADL in 2005 and 2008 had a substantial decline among Chinese elders: in comparison with the year of 2002, an older adult was 21% less likely to be ADL dependent in 2005 ($p<0.001$) and 51% less likely in 2008 ($p<0.001$). Examination of the trends for the five specific ADL items further revealed that dependency in bathing witnessed the largest drop among all specific items from 2002 to 2008, while the decrease of other four items were relatively mild and only happened in 2008. Positive trends were also observed

under the measurement of IADL; however, it was not as substantial and consistent as the changes of the ADL dependency. The trends of disability for specific IADL items showed mixed patterns. For instance, the risk of having difficulty in doing laundry independently increased by 8% in 2005 ($p<0.05$), but decreased by 15% in 2008 ($p<0.001$); and with regard to the difficulty in shopping independently, there was no significant changes in 2005, but the odds ratios was reduced by 12% in 2008 ($p<0.01$).

As can be also seen from Table 2, odds ratios of self-evaluated functional limitation showed no significant changes from 2002 to 2008. Results of specific items revealed that, from 2002 to 2008, self-evaluated functional limitation of men increased significantly in crouching and continuous walking; in contrast, women's functional limitation significantly declined in lifting and walking. Contrary to the positive or neutral disability trends under the self-reported measurement schemes, the objective measurements with three performance tests showed that the Chinese elders had worsening functional health from 2002 to 2008. And such a negative trend was consistent across genders and rural/urban residences.

5. Conclusions

This study detected contrasting temporal changes of disability and functional limitations in the Chinese elderly population aged 65 or over from 2002 to 2008. In particular, the ADL-based disability trends appeared positive with significant declines among Chinese elders from 2002 to 2008; however, in the same period of time, the same elders had worse functional performances if observed objectively. It also seemed that among the four measurements, there existed a gradient from being positive to negative with regard to temporal changes, i.e., ADL-IADL-Nagi scale-performance test.

Inconsistence between ADL/IADL-based disability trends and the temporal changes in objective functional limitations calls for more attentions to reflecting the measurement issues in investigation of disability trends among elders. In comparison with the routinely-used ADL/IADL indices and the Nagi scales, the performance-based measures could directly capture the impairment-based functional limitations in later life, and thus provide information for understanding the structure of disability trends of the elderly population. It is true that adding performance-based tests will raise the survey cost, as these tests usually involve qualified interviewers to conduct the objective tests, more time-consuming and complicated than the self-reporting procedure. However these tests are still worth cost, because any policy misjudgment over the temporal changes on the external and intrinsic dimensions of disability may waste huge investments in public health.

The contrasting trends between performance-based functional limitation and the ADL/IADL disability in this study implied that the declines of ADL and IADL disability as observed in the investigated period could be likely due to substantial improvement in environment, facility and social support of daily lives of Chinese elderly (see Feng et al. 2013; Freedman et al., 2006; Gu et al., in press; Schoeni, Freedman, & Martin, 2008). These findings delivered a valuable message for stakeholders in public health, namely, even though function status of older adults deteriorate in later years, improvement in the non-physiological dimension of disability such as age-friendly living environment, more assistance facility, and better social support could still wrench disability trends toward a positive direction. Examining temporal changes of each item within ADL and IADL indices could often get more hints to understand non-physiological factors which drive changes in disability prevalence (Martin, Zimmer, & Hurng, 2011). Based on results of this study, we speculated that the improvement of bathing facility in home design and the growth of home appliance usage such as washing machines seem to play a major role in these positive changes of ADL and IADL disability.

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