ORIGINAL INVESTIGATION

Prevalence and correlates of successful ageing: a comparative study between China and South Korea

Qiush Feng · Joonmo Son · Yi Zeng

Abstract Successful ageing is often defined as a later life with less disease and disease-related disability, high level of cognitive and physical functions, and an active life style. Few studies have compared successful ageing across different societies in a non-Western social context. This study aims to compare prevalence and correlates of successful ageing between China and South Korea. The data come from the Chinese Longitudinal Healthy Longevity Survey (CLHLS) and the Korean Longitudinal Study of Ageing (KLoSA). A total of 19,346 community-dwelling elders over 65 years were included, 15,191 from China and 4,155 from Korea. A multidimensional construct of successful ageing was used, with the criteria of no major comorbidity, being free of disability, good mental health, engaging in social or productive activity, and satisfaction on life. Correlates of successful ageing included demographics (gender, age, and rural/urban residence), socioeconomic features (financial status, education, and spouse accompany), and health behaviours (smoking, alcohol-drinking, and exercising). The results showed that 18.6 % of the older adults in China was successful agers, which was less than 25.2 % in Korea. When gender and age were adjusted, older adults were 51 % less likely to be successful agers in China than Korea ($p < 0.001$). The association patterns between successful ageing and its correlates are similar between China and Korea. However, before the socioeconomic variables are under control, rural residence was negatively related to successful ageing in China, whereas this is not the case in Korea. And the gender gap of successful ageing was mostly explained by socioeconomic features and health behaviours in Korea, but not in China. In both countries, good financial condition was highly associated with successful ageing. The study suggests that advancement of public health system could better control progression of non-communicable diseases among old people and thus promote successful ageing.

Keywords Successful ageing · Epidemiological transition · China · Korea

Introduction

Since the 1980s, gerontologists started to shift more attention from pathologically impaired elders to successful agers. According to a classical definition by Rowe and Kahn ([1987](#), [1997](#)), successful ageing refers to a later life with less disease and disease-related disability, high level of cognitive and physical functions, and an active life style. Researchers to date have accumulated empirical evidence supporting the validity of this notion (Rowe and Kahn [1999](#)), estimated its prevalence and disparity across different demographic groups (e.g. Hsu [2005](#); McLaughlin et al. [2010](#)), identified associational and predictive factors including, but not limited to genetics (e.g. Glatt et al. [2007](#)), nutrition (e.g. Gaudreau et al. [2007](#)), health behaviour (e.g. Chodzko-Zajko et al. [2009](#)), personality (e.g. Steca et al. [2010](#)), coping strategy (e.g. Ouwehand

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et al. 2007), early life experience (e.g. Brandt et al. 2012; Pruchno et al. 2010), and socioeconomic characteristics such as education and income (e.g. Meeks and Murrell 2001). Various health and social interventions and programmes have also been proposed to facilitate successful ageing in elders (e.g. Fries 2002; Kahana and Kahana 2012). Moreover, with more availability of longitudinal data, recent studies began exploring trajectories of successful ageing (e.g. Hsu and Jone 2012; Tang 2014).

Yet, the idea of successful ageing is not without debate. There are criticisms regarding its narrowly-defined criteria, lack of agency, or ignorance of social/environmental constraints of marginalized elders (Minkler and Fadem 2002; Holstein and Minkler 2003). Competing perspectives such as "compression of morbidity" (Fries 1980) and "the third age" (Carr and Komp 2011), and alternative conceptualizations such as "active ageing" (World Health Organization 2002) and "productive ageing" (Morrow-Howell et al. 2001) have appeared as well, arguing for their own conceptual merits. However, as people are living longer and healthier in our time, successful ageing maintains to be one of the most important themes in gerontology with enormous ongoing research (Bowling and Dieppe 2005; Blazer 2006).

Amidst the growth of successful ageing literature, one well-noted problem is the great variance in prevalence rates reported across different studies. According to Depp and Jeste (2006), for example, the proportion of successful agers ranged from 0.4 to 95.0 % among 27 major studies on successful ageing. Such inconsistency is largely due to the lack of a broadly-accepted definition and measurement scheme on successful ageing. Researchers tend to agree that the successful ageing should be multidimensional, containing not only a biomedical aspect, but also social and psychological domains (Bowling and Iliffe 2006; Young et al. 2009; Jeste et al. 2010). Yet, there is currently no consensus on exactly what specific measurements should be included in the construct of successful ageing. This has been reflected in the recent literature reviews in this field. Phelan and Larson (2002) identified seven elements which have been used in various studies to define successful ageing, such as (1) life satisfaction, (2) longevity, (3) freedom from disability, (4) mastery/growth, (5) active engagement with life, (6) high/independent functioning, and (7) positive adaptation. Bowling and Dieppe (2005) had a similar list which contained eight components of successful ageing, i.e. (1) life expectancy, (2) life satisfaction and wellbeing, (3) psychological health and cognitive function, (4) capacity of personal development, (5) physical health and functioning, (6) psychological characteristics and resources, (7) social, community, leisure activities, integration and participation, and (8) social networks and support. Furthermore, Depp and Jeste (2006)

identified five major domains frequently used to define successful ageing: (1) disability and physical functioning, (2) cognitive functioning, (3) life satisfaction/well-being, (4) social/productive engagement, and (5) presence of illness.

Besides discordance of definitions on successful ageing, it has been also acknowledged that the meaning of successful ageing may vary by cultural and value systems (Keith et al. 1994; Tate et al. 2003; Phelan et al. 2004). As Torres (1999: 38) reported, "Americans… associated it primarily with self-sufficiency and the ability to live alone, while those in Hong Kong could not understand why one would want to be self-sufficient in old age. Instead, they viewed their families' willingness to meet their needs as a sign of successful ageing." Although there have been strong appeals for developing culture-specific measurement for successful ageing (e.g. Lewis 2010; Liang and Luo 2012), to date, there are no established definitions and measurements of culture-specific successful ageing for the non-western countries in current literature.

Due to these problems, quantitative comparative studies on successful ageing among different countries are rare, and this is particularly true for non-western societies (except Lamb and Myers 1999). However, this type of studies could be of special value, as comparing successful ageing across countries could help understand the important relationship between social development and population health, and provide clues to improve related public policy. For example, in a recent study, Hank (2011) compared prevalence rates of successful ageing across 15 European countries and found out that those nations with better eldercare services tend to report higher proportions of successful agers.

Epidemiological transition and its related theories can provide useful guideline to understand variations in successful ageing prevalence. In the epidemiological transition, infectious diseases as a primary cause of death are replaced by degenerative and man-made diseases. To date, there are still less-developed societies where pandemics of infection prevails; in contrast, some developed nations may have entered in the post-transition stage featured by delayed degenerative diseases (Olshansky and Ault 1986). In the post-transition stage, scenarios of population health for older adults could be twisted; whereas morbidity is supposed to be compressed due to positive lifestyle changes and medical advancement (Fries 1980), the same set of factors could save lives of frail old people and thus expand morbidity (Gruenberg 1977). Moreover, increases in morbidity can be offset by decreases in its severity (Manton 1982). Robin and Michel (2004) explicated these intertwining processes in a four-stage model: (1) an increase in the survival of sick persons will lead to an initial expansion of morbidity; (2) improved control of the progression of

chronic disease will lead to dynamic equilibrium between the decrease in mortality and the increase in disability; (3) improved health status and health behaviours in younger cohorts of older adults will lead to some compression of morbidity; and (4) the eventual emergence of very old and frail population will lead to a new expansion of morbidity. Such a model not only reveals how population health of older adults may change in a single society, but also suggests that prevalence of successful ageing may vary across societies due to their different positions in these stages.

This study aims to provide a systematic comparison of successful ageing between China and Republic of Korea (Korea hereafter). Both China and Korea are encountering serious challenges of population ageing. According to the international standard for an ageing society (i.e. 65+ elders over 7 % of the total population), both China and Korea had entered in this state around the year of 2000. China is and will continue to be the largest ageing society in the world for a foreseeable future (Flaherty et al. 2007). Chinese over 65 years old reached 111.4 million in 2010, amounting to one-fourth of the world older adults, and will triple to 330.6 million from 2010 to 2050 (United Nations Population Division 2009). Korea may be a country with the fastest ageing rate in human history (Kim 2006). The proportion of older adults in Korea will be doubled from 7 to 14 % in only 18 years from 2000 to 2018. For instance, to reach at that level of rapid ageing trend, United States took 71 years (1942–2013) and Japan spent 24 years (1970–1994). By the year 2050, with 38 % of its population over 65 years old, Korea will join Japan, Spain, and Italy as the one of the oldest countries in the world (Howe et al. 2007).

China and Korea make good cases for comparison. They share similar culture but differ in stages of economic development. As East Asian societies, they hold a strong Confucian tradition and share a similar value system in regard to eldercare. In both societies, filial piety is a core ethical obligation, and a good family support, particularly from adult sons, is highly valued by elders in securing a comfortable later life (Koh and Koh 2008). Cultural differences, therefore, can be controlled at minimum in the comparison of these two countries. Nevertheless, China and Korea have a significant gap in development. In 2008, GDP per capita was 3,267 US dollars, much less than 19,115 US dollars in Korea (World Bank Group 2010). Joining the Organization for Economic Co-operation and Development (OECD) in 1996, Korea became a developed nation in the 1990s due to its fast-paced and compressed economic growth from the early 1960s, whereas China to date is still a underdeveloped nation, though its economy has been rapidly rising up after the market reform in 1980s.

Both nations have gone through a rapid epidemiological transition in the past decades; however, Korea is ahead of China in terms of the post-transition stage. In both countries, fertility and mortality rates declined dramatically since the last century, and non-communicative diseases such as heart diseases have become the leading cause of death (Suh 2001; Yang et al. 2008). That is, the epidemiological transition has been mostly completed in both countries. However, Korea occupies a more advantaged position in the post-transition stage compared to China, as is well supported by the key demographic statistics. From 2000 to 2005, the crude birth rate was 14.0 per thousand in China and 10.4 in Korea; the total fertility rate was 1.55 in China and 1.22 in Korea; the crude death rate was 6.6 per thousand in China and 5.3 in Korea; the life expectancy at birth was 73.4 years in China and 77.4 years in Korea; and the infant mortality rate was 25.6 per thousand in China and 5.1 per thousand in Korea (United Nations Population Division 2009).

In the four-stage model of Robin and Michel (2004), China may still be at the first stage featured by "initial expansion of morbidity", where the epidemiological transition is characterized by the rise of chronic diseases (Cook and Bummer 2004). In tandem with the rapid social and economic development in China, changes in diets, decreased physical activity, and high rates of smoking contribute to this trend (Yang et al. 2008). In contrast, Korea may have already entered "dynamic equilibrium" with "improved control of the progression of chronic disease". Such a gap in the post-transition stage is based on the developmental difference of the public health systems of the two nations. China is still at the initial stage to reform and improve its old public health system. In particular, China is underdeveloped yet in delivering medication and caring for its older adults (Dong and Phillips 2008); in contrast, the public health system of Korea has been at a more mature and advanced level. Social insurance system for health care in Korea launched in 1977 and it incrementally expanded to a universal national health insurance program in 1989 (Kwon 2003). Additionally, to meet the specific demands of the eldercare and improve the quality of later life, Korea introduced a long-term care social insurance system for persons aged 65 or older in 2008 (Kim et al. 2010). As a result, the incidence and progression of the non-communicable diseases of old people and its health outcomes, as the major component of successful ageing, should be better controlled in Korea than in China. Therefore, we hypothesize that *Korea outperforms China in the prevalence of successful ageing and all of its domains*.

Additionally, we would like to further compare major correlates of successful ageing between China and Korea. There have been few theoretical models about how correlates of population health vary at different stages of the epidemiological transition, a case of which is the disability

transition model proposed by Myers and Lamb (1993) (also see Myers et al. 2003). According to this model, during the epidemiological transition, prevalence of disability becomes higher among females, old-age people, lower socioeconomic groups, and rural dwellers. However, these propositions may not directly apply to this comparative study, as China and Korea have completed the epidemiological transition. On the other hand, in the current literature, the associational patterns for correlates of successful ageing has been reported mostly similar within and between developing and developed countries (e.g. Depp and Jeste 2006; Lamb and Myers 1999). We therefore assume that *associational patterns of correlates of successful ageing are similar in China and Korea.*

Method

Data

The data come from two national surveys, the Chinese Longitudinal Healthy Longevity Survey (CLHLS) and the Korean Longitudinal Study of Aging (KLoSA). The CLHLS is a national survey of the Chinese older adults, which started in 1998 and follow-ups were implemented in 2000, 2002, 2005, and 2008 with the sample sizes of 8,959, 11,161, 15,638, 18,524, and 19,863, respectively. The survey randomly selected half of the total number of counties and cities in 22 out of 31 provinces in China. In each county/city, all centenarians were surveyed along with one nearby octogenarian and nonagenarian of pre-designated age and sex in order to have comparable numbers of randomly selected male and female octogenarians and nonagenarians at each age from 80 to 99. From the year of 2002, a younger group aged 65–79 years was added from the neighbourhood of centenarians based on pre-designated age-sex ratios. All information was obtained through in-home, face to face interviews. All respondents were tracked in the later waves unless decease or loss to follow-up occurred. The response rates are 88 to 90 % in the waves of CLHLS. A more detailed introduction about the survey design of the CLHLS has been presented elsewhere (Zeng et al. 2008), and the data quality of the CLHLS was reported as good and representative of the older adults in mainland China (Gu 2008).

The KLoSA is a national longitudinal survey on population ageing in Korea, and the baseline survey was conducted in 2006. The target sample of the KLoSA 2006 was the Koreans aged 45 years or older. Households were the basic sampling unit, which were selected using a multistage stratified sampling approach. First, regions of the 15 metropolitan cities and provinces of Korea were stratified into urban and rural areas. A total of 803 and 197 districts

were then allocated into urban and rural areas, respectively. From each district, 12–15 households were randomly selected. Trained interviewers conducted interviews with each family in which at least one household member was aged 45 years or older. The KLoSA 2006 wave gathered a panel of 10,254 respondents through in-home, face-to-face interviews. The household response rate was 70.7 %. More details about survey design have been reported elsewhere (KLI KLoSA team 2007; Jang et al. 2009).

We chose the 2005 wave of CLHLS and the 2006 wave of KLoSA for comparison. Institutionalized elders were excluded from the CLHLS sample since the KLoSA did not include elders in institutions. Cases between the age range of 45 and 64 from the KLoSA 2006 were also dropped. The proportions of missing values are around 1 % in most variables we used; thus no imputations were applied. As a part of the longitudinal survey, the 2005 wave of CLHLS contained both newly-collected cases of 7,316 elders, and also retained cases from previous waves, 978 elders from the 1998 wave, 1,488 from 2000, and 5,409 from 2002. As a result, the data combined have a total of 19,346 community-dwelling elders aged over 65 years from the two countries, 15,191 from China and 4,155 from Korea.

Measurement

Successful ageing

In this study, successful agers are defined as those who are free from major illness and disability, having no depressive symptom, participating in social or productive activities, and being satisfied with life. It is worth noting that we are not to develop/validate a new measurement for successful ageing, but to adopt a commonly-practiced and empirically-feasible operationalization of this conception to conduct a comparative study. As there is no agreement on how to define successful ageing, our measurement scheme involves three concerns, that is, the classic three-component definition of Rowe and Kahn (1987, 1997), the literature review on the frequently-used components of successful ageing (Phelan and Larson 2002; Bowling and Dieppe 2005; Depp and Jeste 2006), and the availability of data. Following this measurement scheme, all components of successful ageing suggested by Rowe and Kahn were included in the present study only except cognitive function, the index of which is not comparable among the two countries. Moreover, we added the dimension of life satisfaction, as it "has been the most commonly proposed definition of successful ageing" in the literature (Bowling and Dieppe 2005:1549). This measurement scheme is similar to major recent studies of successful ageing (e.g. Ng et al. 2009; McLaughlin et al. 2010; Hank 2011). The

specific measures for successful ageing components are summarized as below:

1. Absent of major illness: Four most prevalent death-causing diseases in China and Korea were used to distinguish successful agers, including heart disease, stroke, chronic lung disease, and cancer (He et al. 2005; Khang et al. 2004). The presence or absence of the diseases was determined by medical diagnoses reported by respondents. A successful ager is free of any of them (see McLaughlin et al. 2010).

2. Free of disability: Respondents were asked whether they needed any help in activities of daily living (ADL) and instrumental ADL (IADL) in both CLHLS and KLoSA. ADL items included bathing, dressing, toileting, getting out of bed, feeding (Cronbach's α, China = 0.90; Korea = 0.92); IADL items were in regard to shopping, preparing meals, doing laundry, going out in a short distance, and transportation (Cronbach's α, China = 0.91; Korea = 0.91). A standard of successful ageing is that a respondent should have no disability in ADL and not more than one disability in IADL (see Menec 2003).

3. No depressive symptom: We utilized three depressive symptoms asked in the CLHLS and KloSA to set up a criterion of successful ageing, i.e. whether the respondent felt fearful, lonely, or useless in daily life (see Zeng et al. 2013). A successful ager should have none of these depressive symptoms (see Uotinen et al. 2003).

4. Active social/productive engagement: Both CLHLS and KloSA asked respondents whether they were currently taking part in any social activities such as social clubs or volunteer organizations and if they were working for any forms of compensation at present. To be a successful ager, a respondent should participate in either social or economic activities (see Strawbridge et al. 2002).

5. Satisfaction on life: In the CLHLS, life satisfaction was measured on a five-point Likert scale, "very bad", "bad", "fair", "good", and "very good". And a successful ager should report life satisfaction as "good" or "very good" (see Von Faber et al. 2001). In the KLoSA, a 0–100 scale of life satisfaction was adopted. To be as much as comparable with the CLHLS measurement, respondents with a rating score over 60 were considered as successful agers.

Correlates

This study examines correlates of successful ageing that have been extensively discussed in the previous literature (Phelan and Larson 2002; Depp and Jeste 2006; Jeste et al.

2010). Demographic measures were gender, age, and rural/urban residence. Socioeconomic factors included spouse accompany (currently living with a spouse or not), self-rated financial status (poor/fair/rich), and education achievement (no schooling versus at least one year of schooling). Correlates of health behaviour had current status of smoking (yes/no), alcohol-drinking (yes/no), and regular exercising (yes/no).

Analytical strategy

We firstly estimated the crude rates of successful ageing and its components in both countries. For unbiased estimation of national prevalence of successful ageing, it was necessary to apply appropriate weights because both CLHLS and KLoSA are not based on equal probability sampling. All descriptive results adopted the weighting methods recommended by the technical teams of CLHLS and KLoSA (CLHLS Research Team 2000; KLI KLoSA Team 2007).

To further compare China and Korea, random effect logistic regression models were used to acquire the gender-age-adjusted odds ratios of successful ageing and its components for Chinese elders in reference to Korean counterparts. This method corrected the covariance within geographic regions (22 provinces in CLHLS; 15 metropolitan city/provinces in KLoSA) through introducing a random intercept for each geographic location in the model (Raudenbush et al. 2004). To compare associational patterns between successful ageing and its correlates in each country, three nested random effect logistic regression models were developed. Model I included demographic variables. Model II added socioeconomic characteristics. Model III as the full model introduced variables of health behaviour.

We conducted descriptive statistics and regression models by gender and rural/urban residence whenever appropriate, in order to examine the gender- and residence-specific international differences in prevalence of successful ageing, components of successful ageing, and association patterns of correlates. The gender disparity in health is broadly observed in developed nations such as Korea, while it is more convoluted in developing countries such as China where old women tend to be more significantly disadvantaged than men in accessing health resources (Zeng et al. 2003). The contrast of rural/urban residence is another dimension of importance. It is well-reported that there has been great health inequality between the rural and urban populations in China (Zhang and Unschuld 2008). Non-weighted regression models are applied here as they are more efficient and produce comparatively accurate standard errors in estimation when results from non-weighted and weighted models are not substantially

different (Winship and Radbill 1994). All analyses were conducted using Stata/SE 12.0.

Results

Based on the measures adopted in this study, 18.6 % of elders in China were successful agers, whereas the rate was higher in Korea as 25.2 % (Table 1). Regarding to components of successful ageing, Korean elders had less diseases and depressive symptoms, and engaged in more social/productive activities than their Chinese counterparts. The gender-specific results further indicate that in both China and Korea, males had less depressive symptoms, were more socioeconomically active, and in conclusion had a higher rate of successful ageing than females. The prevalence of successful ageing was not substantially different between rural and urban regions in the two countries. However, according to its specific components, older adults living in rural areas had fewer major illness, more depressive symptoms, and more social/productive engagement in comparison to urban elders. We additionally report zero-order correlation between successful ageing and its components in each country (Table 2). The correlation patterns between China and Korea are quite similar, except that life satisfaction seemed to be less associated

with disability, depressive symptoms, and social/productive engagement in China than in Korea.

In regression models adjusted by gender and age, elders in China were 51 % less likely to be successful agers than Korean older adults, and similar results were observed for each component of successful ageing except satisfaction on life (Table 3). This cross-national gap persisted by gender and rural/urban residence.

The country-specific pattern of association between successful ageing and its correlates is summarized in Table 4. In the two societies, younger age, better financial status, education, spouse accompany, and alcohol-drinking were associated with higher likelihood of successful ageing. In particular, elders who reported a good financial status had an extraordinarily higher probability to be successful agers than those of poor financial status (approximately 6 times in China and 13 times in Korea). However, there were also some major differences in correlates of successful ageing between the two countries. In China, females were less likely to be successful agers than males by about 44 % in the baseline model (Model I) and although such a gender gap decreased to 24 %, it does not disappear when correlates of socioeconomics and health behaviour were taken into account (Model III); in contrast, even though the baseline model of Korea also showed a gender gap, the difference was fully explained away in the

Table 1 Descriptive statistics for the Chinese and Korean samples (weighted results)

	China					Korea				
	Total	Female	Male	Rural	Urban	Total	Female	Male	Rural	Urban
Sample size	15,191	8,697	6,494	8,520	6,671	4,155	2,419	1,736	1,200	2,955
Successful ageing (%)	18.6	15.4	22.0	18.3	18.9	25.2	20.4	32.1	26.6	24.4
Absence of major illness (%)	75.1	75.9	74.2	79.4	69.5	82.6	84.4	79.9	84.6	81.6
Free of disability (%)	86.0	84.8	87.2	86.3	85.5	81.3	81.5	80.9	81.3	81.3
No depression symptom (%)	75.2	71.6	79.1	72.3	79.1	78.2	74.6	83.6	75.6	79.6
Active social/productive engagement (%)	51.2	43.6	59.5	54.4	46.9	54.4	46.2	66.6	59.6	51.8
Satisfaction on life (%)	57.1	57.1	57.1	55.1	59.8	55.0	52.3	59.0	55.0	55.0
Correlates										
Female (%)	52.2	100.0	0.0	51.9	52.6	59.6	100.0	0.0	59.5	59.6
Age (year), Mean (SD)	72.5 (6.0)	72.9 (6.2)	72.0 (5.6)	72.6 (6.0)	72.3 (5.9)	73.0 (6.4)	73.5 (6.7)	72.3 (5.8)	73.3 (6.7)	72.9 (6.2)
Rural residence (%)	57.5	57.2	57.9	100.0	0.0	33.7	33.7	33.7	100.0	0.0
Financial status (%)										
Poor	15.7	16.6	14.7	18.2	12.3	26.4	28.4	23.5	24.0	27.6
Fair	68.8	69.5	68.0	68.4	69.3	54.5	55.3	53.2	58.9	52.2
Rich	15.6	13.9	17.3	13.5	18.4	19.2	16.3	23.3	17.1	20.2
Education over one year (%)	54.0	34.0	75.9	46.0	65.0	62.8	49.0	83.1	49.3	69.6
Spouse accompany (%)	59.6	46.7	73.7	57.8	62.0	62.3	43.5	90.0	64.8	61.1
Smoking at present (%)	27.0	9.3	46.4	29.2	24.1	14.9	4.1	30.9	17.1	13.8
Drinking at present (%)	23.7	10.0	38.7	26.1	20.5	27.1	11.0	50.8	28.8	26.3
Exercising at present (%)	39.6	36.0	43.6	27.0	56.7	30.3	24.3	39.1	15.0	38.1

Table 2 Zero-order correlation of successful ageing and its components in China (upper right) and Korea (bottom left)

	Successful ageing	Absence of major illness	Free of disability	No depression symptom	Active social/ productive engagement	Satisfaction on life
Successful ageing	1.00	0.29	0.20	0.28	0.48	0.42
Absence of major illness	0.27	1.00	0.16	0.09	0.08	0.05
Free of disability	0.28	0.14	1.00	0.19	0.26	0.06
No depression symptom	0.31	0.12	0.21	1.00	0.09	0.17
Active social/productive engagement	0.53	0.06	0.21	0.19	1.00	0.04
Satisfaction on life	0.52	0.08	0.17	0.31	0.17	1.00

Table 3 Gender- and age-adjusted odds ratios of successful ageing and its components for older adults of China in reference to Korea

	Total	Female	Male	Rural	Urban
Successful ageing	0.49***	0.53***	0.48***	0.43***	0.54***
Absence of major illness	0.44***	0.38***	0.54**	0.64***	0.39***
Free of disability	0.87*	0.78**	1.03	0.95	0.83*
No depressive symptoms	0.79*	0.86*	0.68***	0.60***	0.96
Active social/productive engagement	0.65***	0.73**	0.57***	0.62***	0.63***
Satisfaction on life	1.02	1.19**	0.84*	0.75**	1.20**

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

final model. Second, rural/urban residence was not significantly related to successful ageing in Korea all through the models; however, the Chinese rural elders had significantly lower likelihood of being successful agers than their urban counterparts, though such disadvantage disappeared when correlates of socioeconomics and health behaviour were added.

Table 5 examines possible interactions between gender/ residence and all other correlates in China and Korea. The gender-specific results showed that exercise significantly promoted successful ageing for Korean females, but not for males; and in China, education and alcohol-drinking increased probability of successful ageing only for men. The rural/urban disparity was mainly observed in China: education and spouse accompany were significantly associated with a higher probability of successful ageing only in rural area.

Conclusion and discussion

The notion of successful ageing reveals an important perspective to understand later life, by which ageing is no longer characterized by an inevitable and irreversible life stage with morbidity, but can instead be viewed as a process full of possibilities for physical, cognitive, emotional, and social functioning to be reinculcated and enhanced. This study compared the prevalence of successful ageing and its correlates in China and Korea. To our knowledge, this is the first comparative study of successful ageing between a developing and a developed nation under a non-western background.

According to the present study, the prevalence estimates of successful ageing in China and Korea were 18.6 and 25.2 %, respectively, which fall into a reasonable range when compared with other studies. Although rates of successful ageing are reported very differently in the literature, when the classic model of Rowe and Kahn is adopted for measurement, most prevalence estimates tend to cluster at the range of 10 to 40 % (Depp and Jeste 2006; Jeste et al. 2010). For example, the first empirical study using the classic definition (Berkman et al. 1993) reported that about one-third of Americans aged successfully. This also applies to other countries such as Netherlands (von Faber et al. 2001), Australia (Andrews et al. 2002), and Finland (Uotinen et al. 2003). Along this line, McLaughlin et al. (2010) recently reported prevalence rates in the United States from 10.9 to 11.9 % in the period from 1998 to 2004; and Hank (2011) found out a mean value of 8.5 % among 15 European country, which ranged from 1.6 % in Poland to 21.1 % in Denmark. It is particularly interesting to note that a rate of 28.6 % was reported by Ng et al. (2009) for Singapore, an Asian society, and this study applied the classical definition of successful ageing plus life satisfaction, which was similar to the measurement scheme of this study.

Our first hypothesis is mostly supported by the empirical finding that Korean elders were more likely to age

Table 4 Odds ratios of successful ageing in China and Korea

China	I	II	III
Female	0.56***	0.70***	0.76***
Age	0.91***	0.92***	0.92***
Rural residence	0.86*	0.97	1.04
Financial status (reference: poor)			
Fair		3.11***	3.01***
Good		6.45***	5.96***
Education over 1 year		1.25**	1.20*
Spouse accompany		1.46***	1.47***
Smoking at present			0.97
Drinking at present			1.35***
Exercising at present			1.48***
Rho	0.07***	0.07***	0.07***
N	15,027	14,899	14,894
Korea	**I**	**II**	**III**
Female	0.57***	0.84*	1.03
Age	0.93***	0.95***	0.96***
Rural residence	1.09	1.15	1.16
Financial status (reference: poor)			
Fair		4.93***	4.79***
Good		13.30***	13.04***
Education over 1 year		1.81***	1.81***
Spouse accompany		1.48***	1.52***
Smoking at present			0.98
Drinking at present			1.55***
Exercising at present			1.17
Rho	0.03***	0.02**	0.02**
N	4,151	4,147	4,146

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

successfully in comparison with the Chinese counterpart, and were doing better in most components of success ageing. Although both China and Korea are facing rapid population ageing and the chronicle diseases are currently the leading cause of death in both countries, they differ in the post-transition stage. There is a substantial gap between the two countries in terms of development of the public health system and the eldercare services. And the advanced eldercare programmes in Korea have promoted successful ageing among its senior citizens; comparatively, China is still on the way to establish its national eldercare system to catch up with the Korean level. Such a finding is indeed echoing findings of the recent comparative study of Hank (2011) on the 15 European countries. We further tested the above ideas by examining the effect of medical care programmes on successful ageing in China. Among the four major types of medical care programmes in China—that is, the public free medical care, the cooperative medical insurance, the basic medical insurance, and catastrophic medical insurance—the entitlement of public free medical care was significantly and positively associated with

successful ageing, while the other three covariates were not (results available upon request). This outcome supports our argument that the provision of good eldercare can promote successful ageing. The public free medical care is a premium public benefit in China, only entitled to certain employees in public sector; in comparison, the other three programmes are recently initiated and their care quality is not as high as the public free medical care, so that they may still be premature to matter significantly for successful ageing of its beneficiaries.

It is notable that Chinese and Korean elders were not significantly different in terms of life satisfaction, a component of successful ageing. In comparison with health-based domains of successful ageing such as morbidity and disability, life satisfaction is more comprehensive and subjective. It represents an important direction of re-defining successful ageing beyond health, in which ageing successfully refers to a general perception of "a good life" in old age (Strawbridge et al. 2002; Glass 2003). It is true that populations of developed economy often have higher level of life satisfaction than those of less-developed (di

Table 5 Odds ratios of successful ageing in China and Korea by gender and residence

China	Gender		Residence	
	Female	Male	Rural	Urban
Female	–	–	0.75**	0.77*
Age	0.91***	0.93***	0.92***	0.93***
Rural residence	1.01	1.04	–	–
Financial status (reference: poor)				
Fair	2.44***	3.60***	2.90***	3.36***
Good	4.86***	7.13***	5.42***	7.29***
Education over 1 year	1.05	1.27*	1.23*	1.17
Spouse accompany	1.42**	1.50***	1.68***	1.22
Smoking at present	0.92	1.00	0.97	1.00
Drinking at present	1.13	1.46***	1.37**	1.33*
Exercising at present	1.62***	1.37***	1.18	1.91***
Rho	0.10***	0.06***	0.08***	0.07***
N	8,530	6,364	8,328	6,566

Korea	Gender		Residence	
	Female	Male	Rural	Urban
Female	–	–	1.21	0.96
Age	0.96***	0.96***	0.96**	0.96***
Rural residence	1.04	1.29	–	–
Financial status (reference: poor)				
Fair	4.81***	4.79***	6.33***	4.27***
Good	12.76***	13.68***	12.72***	13.23***
Education over 1 year	1.49**	2.80***	2.43***	1.50**
Spouse accompany	1.52***	1.70*	1.62*	1.50**
Smoking at present	0.74	1.02	1.31	0.84
Drinking at present	1.82***	1.43**	1.72**	1.47**
Exercising at present	1.39**	0.96	1.15	1.18
Rho	0.03***	0.01*	0.04**	0.02***
N	2,415	1,731	1,199	2,947

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

Tella et al. 2003); however, "…happiness is not the result of being rich, but a temporary consequence of having recently becoming richer." (Inglehart 1990: 212). The recent rapid economic growth of China thus may have positively affected the life satisfaction of the Chinese older adults, catching up with the level of Korea. Moreover, criteria in evaluating the life quality may vary across countries (Kapteyn et al. 2009), as may further confound the association between economic development and life satisfaction. Lastly, although life satisfaction measurements generally converge (Diener et al. 2013), it is still possible that the measurement differences adopted in the two countries may bring certain bias in this comparison. Further studies are definitely warranted to clarify this issue.

China and Korea were similar with regard to the associational patterns of correlates of successful ageing, as speculated by the second hypothesis; however, there are more nuanced findings too. We found out, before the socioeconomic variables are controlled, rural residence was negatively related to successful ageing for Chinese elders, whereas this is not the case for Korean older adults. Such a contrast signalled nation-specific rural/urban disparities between the two countries. The health care system of China's rural areas is severely disadvantaged in comparison to urban regions. In fact, the rural cooperative system of medical care was abandoned after 1980s without any replacement until very recently (Dong and Phillips 2008). So far, Chinese rural elders still have significantly limited pension coverage and far less access to health care resources as compared to urban counterparts. However, the rural/urban gap in Korea is not as severe as that of China. In fact, overcrowding and greater level of pollution in the Korean metropolitan areas could even encourage some old people to relocate themselves in rural areas after retirement (United Nations Population Fund 2007).

The finding that females were less likely to age successfully in both China and Korea is in line with the gender paradox in health, i.e. women usually live longer yet with worse health than men. However, it is worth noting that the gender gap in health was mostly explained by socioeconomic features and health behaviours in Korea, but not in China. This implies that there should be other factors contributing to the health disadvantages for females in China. There exist major institutional barriers in China for women to get as much medical/care resources as men (Zeng et al. 2003). For example, the Chinese medical system has been long biased towards employees in the public sectors, where men outnumbered women. Such a systemic inequality should be concerns for the ongoing reforms of the medical system in China.

Another main finding of the study is that the self-reported financial status has potential to be an effective indicator to identify successful agers. In both China and Korea, elders reporting good financial status had extraordinarily higher likelihood to be successful agers than elders of poor status. Elders with higher socioeconomic status tend to be healthier in late life and this association may also apply to successful ageing (e.g. Chaves et al. 2009; Jang et al. 2009). Such a close association between the self-rated financial status and successful ageing may also be due to the fact that perceived financial status is linked to the economic stress, which is in turn strongly related to health (Thoits 2010; Yeung and Xu 2011). Considering it is often hard to acquire and validate actual personal income in countries such as China, the self-reported financial status may be considered as a good alternative in future studies of successful ageing. Additionally, it is not surprising for us to find that alcohol-drinking promoted successful ageing in both China and Korea (Feng et al. 2010). Alcohol-drinking, in East Asian culture, is not simply a dietary habit, but a sociocultural ritual, whereby social connections or the so-called *Guanxi* are built, maintained, and strengthened. Therefore, alcohol-drinking behaviour of an elder is possibly an indication of maintenance of social network, which is highly associated with a better health of late life (Gu et al. 2008).

There are some major limitations in this study. The datasets used in this study come from two major national surveys on population ageing in China and Korea. The questionnaire designs of both surveys followed the international standard. We thus considered that these two datasets have good potential for comparative studies. However, the CLHLS and KLoSA are still different surveys and even minor differences in question wordings may have brought biases. Although we have made all possible efforts to keep such differences to minimum by selecting most close items between the two datasets, we acknowledge that the study may still have comparability issues. For instance, in measuring life satisfaction, we had to compromise to deal with two different sets of response categories. In addition, the depression measurement formed by three relevant items was also limited. Another issue is that we could not include institutionalized elders in this study because the sample of KLoSA did not cover them. Elders in institutions are less likely to be successful agers in East Asian societies, and ratios of institutionalization are lower than 3 % in both China and Korea. Therefore, the exclusion of institutionalized elders may not create serious bias in estimation. Lastly, it was not feasible for us to adopt a culturally specific scheme of successful ageing for this comparative project. This is largely due to the current lack of understanding of successful ageing in non-western societies. We thus call for more efforts to incorporate culturally unique elements into the concept of successful ageing.

In conclusion, this study has several major findings and implications. Firstly, the fact that Korea outperformed China in the prevalence of successful ageing suggests that advancement of public health system and eldercare service could effectively promote successful ageing among the elderly population. Secondly, in comparative studies, life satisfaction, if applied as a component of successful ageing, may not follow the associational pattern of health-based indicators. Thirdly, in East Asian countries, self-reported financial condition can be a particularly efficacious factor in differentiating successful agers.

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