AGEING WELL: STUDIES OF ITS GLOBAL AND MULTIDOMAIN AND CONSTRUCT AMONG MULTI-ETHNIC SINGAPOREAN SENIORS

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DECLARATION

I hereby declare that this thesis is my original work and it has been written by

me in its entirety. I have duly acknowledged all the sources of information

which have been used in the thesis.

This thesis has also not been submitted for any degree in any university

previously.

Gwee Xinyi

15 August 2013

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ABSTRACT

Background: There is lack of research examining the construct and measurement of successful ageing among Singaporean older adults. It is important to understand successful ageing within socio-cultural context as it is influenced by environmental factors.

Objectives: To explore multidimensional and global constructs of successful ageing among Singaporean Chinese, Malay and Indian older adults aged 65 and above. We first evaluated the validity of a broad multidimensional model of successful ageing (**study I**). Next, the validity and reliability of a self-rated single-item scale of global successful ageing was examined (**study II**). Gender and ethnic-based differences in subjective ratings on the self-rated single-item scale of global successful ageing and in relation to variables associated with successful ageing was investigated in **study III**. **Study IV** further explored the subjective perceptions of successful ageing.

Methods: Four studies were reported in this thesis. In **study I**, multidimensional model of successful ageing (physical health and well-functioning; cognitive and emotional well-functioning; higher social functioning and active life engagement and high life satisfaction) was examined using cross-sectional (N=1281) and longitudinal (N=865) secondary data from Chinese participants in the Singapore Longitudinal Ageing Study. In **study II**, cross-sectional analyses were performed on 489 participants from Singapore Study of Successful Ageing (SSOSA). The self-rated single-item scale of global successful ageing was analysed for its relationship to dimensional models of successful ageing (physical health and function; mental well-being; social functioning; psychological and spirituality), including outcome measures (life satisfaction and quality of life). Reliability of the scale was assessed with 33 participants. **Study III** used SSOSA data from 495 participants to explore gender and ethnic-based differences in subjective ratings on the self-rated single-item scale of global successful ageing and in relation to ageing perceptions, mortality salience/spirituality, health status, and life satisfaction. **Study IV** explored successful ageing in 8 focus groups of 46 participants using qualitative research methodology.

Results: The multidimensional model of successful ageing demonstrated good convergent validity with concurrent health status and healthcare use parameters. Baseline successful ageing status was also significantly associated with better quality of life measured with SF-12 MCS, $F(1, 865)=7.9$, $p=<.001$, and PCS, $F(1, 865)=5.8$, $p=<.05$ **(Study I)**. The self-rated single-item scale of global successful ageing was significantly correlated to all dimensional models of successful ageing (r from 0.11 to 0.30). The scale was also the best predictor of life satisfaction (*beta*=.54; R^2=28.9%). Excellent test-retest correlations were found, r=0.93 **(Study II)**. Gender and ethnic differences were found in **study III**. Females [$F(1, 494)=8.23$, *p<.01*] and Malays [$F(2, 493)=4.11$, *p<.05*] rated themselves to be ageing more successfully despite facing more limitations in performing physical functioning activities. In **study IV**, physical and cognitive well-being; harmonious family relations; meaningful social engagement and network; positive adaptation and emotional wellness; positive spirituality; and sufficient financial resources and autonomy were expressed as important for successful ageing. Culture-specific factors relating to family relationships and religiosity were found.

Conclusion: This thesis supports the use of a self-rated single-item scale of global successful ageing that may be used as a universally acceptable standard measurement for use in population monitoring and comparative analyses. Criterion-based multidimensional measures of successful ageing, given some practical limitations, remain potentially useful in programme intervention and evaluation for relevant outcomes.

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LIST OF ABBREVIATIONS

ADL	Activity of Daily Living
ANOVA	Analysis of Variance
BMI	Body Mass Index
CAM	Complementary and Alternative Medicine
CD-RISC	Connor-Davidson Resilience Scale
CFQ	Cognitive Failures Questionnaire
CI	Confidence Interval
COPD	Chronic Obstructive Pulmonary Disease
DF	Degrees of Freedom
DSM-IV	Diagnostic and Statistical Manual of Mental Disorders version- IV
DV	Dependent Variable
GDS	Geriatric Depression Scale
IADL	Instrumental Activity of Daily Living
IHD	Ischemic Heart Disease
IV	Independent Variable
LASA-D	Pearlin Mastery Scale
LOT-R	Life Orientation Test-revised
MCS	Mental Component Score
MMSE	Mini-Mental State Examination
NSI	Nutrition Screening Initiative
OR	Odds ratio
PCS	Physical Component Score
POMA	Performance-Oriented Mobility Assessment of balance and gait
SA	Successful ageing
SD	Standard Deviation
SE	Standard Error
SF-12	12-item Short-Form Health Survey
SF-36	36-item Short-Form Health Survey
SLAS	Singapore Longitudinal Aging Study

SOC	Selective optimization with compensation
SPSS	Statistical Package for Social Science
SSOSA	Singapore Study of Successful Ageing
SWLS	The Satisfaction with Life Scale
WHO	World Health Organization

LIST OF PUBLICATIONS

1. Ng TP, Broekman BFP, Niti M, **Gwee X**, Kua EH. Determinants of successful ageing using a multidimensional definition among Chinese elderly in Singapore. American Journal of Geriatric Psychiatry, 2009 May; 19(5): 407-416.

2. **Gwee X**, Nyunt SZ, Kua EH, Jeste DV, Kumar R, Ng TP. Reliability and validity of a self-rated analogue scale for global measure of successful ageing. Accepted for publication by the American Journal of Geriatric Psychiatry, Sept 2013.

3. **Gwee X**, Nyunt SZ, Kua EH, Jeste DV, Kumar R, Ng TP. Ethnic and gender dimensions of successful ageing in Singaporean older adults. (Drafted)

4. **Gwee X**, Marshal J, Ng TP. An exploratory study on the perceptions of successful ageing among Singaporean Chinese, Malay and Indian older adults. (Drafted)

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CHAPTER 1

INTRODUCTION

The twentieth century advancement of technology, science and medicine has contributed to the growing ageing population in many countries[1]. However, worldwide population ageing also leads to an increased societal burden of care. In order to minimise this tremendous effect on the economies, individuals, families and communities, it is of major importance to help older adults in ageing successfully. Understanding successful ageing is therefore, an important area of research that is of particular relevance and importance in promoting well-being among older adults[2]. Using both quantitative and qualitative data, this thesis focused on better understanding the construct of successful ageing among Singaporean older adults aged 65 and above. Both multidimensional and global constructs of successful ageing, including their measurements, were examined. The role of gender and culture on successful ageing was also explored. The general background and context of the thesis is covered in Chapter 1 while detailed literature review is presented in chapter 2.

1.1 Fast ageing population and its impact

Rapid population ageing is an issue faced by many countries and it is likely that this unprecedented growth will create radical changes in the age distribution over the next several decades[3]. It was reported by the World Health Organisation [WHO] that the world's population aged 65 and above will triple from 524 million in year 2010 to 1.5 billion in 2050[4]. Likewise in Singapore, recent projections estimated that the number of older adults aged

65 and above will increase from 9.9% (300,000) in 2012 to 19% (900,000) by 2030[5], such that every one in five residents will be a senior citizen.

In addition, socioeconomic development and better healthcare has also contributed to the lengthening of lifespan for older adults[6]. Therefore, not only are there more older adults, these older adults are also growing older at the same time.

Older adults living longer faced greater morbidity from chronic, physical and mental impairments and disabilities. This leads to an increased burden not only for older adults themselves but also on the economy and care-givers as more financial, medical care and other resources are required. Therefore, the challenge is to alleviate the burden of care and high costs of health-related spending in old age. One method to narrow the gap between increasing need for healthcare and limited resources is to help older adults age successfully[7]. Understanding why some age more successfully while others suffer from more declines is of particular relevance and importance to interventions and policies targeting the ageing population. Identification of predictors of successful ageing is essential in designing and implementing programs that are relevant for the population. Furthermore, such research benefits future generations of ageing adults in maintaining and enhancing their quality of life.

1.2 Singapore and successful ageing

By 2050, Singapore was projected to be the fourth demographically oldest country in the world[8]. Currently, Singapore has the fourth best life expectancy rate with an estimated life expectancy of 85 for women and 80 for

men[9].   However, Singapore is also one of the countries facing a decline in fertility rate[6], whereby the total fertility rate was 1.29 in 2012[10].

The growth of the silver generation coupled with the lengthening of average life expectancies and low fertility rate put tremendous effect on the economy, individuals, families and communities. Therefore, to cope with the challenges presented by this demographic transformation, Singapore has officially adopted "Successful Ageing" as its vision for public policy since 1999[11]. The aim is to empower individuals to age with dignity and security while remaining as integral members of society; with family as the first line of support by looking after the physical and emotional needs of their senior member[11].

However, despite acknowledging the importance of successful ageing, a search in the existing literature revealed little or no research examining successful ageing with Singaporean older adults. There is a lack of empirical data regarding successful ageing within the local context.

1.3 History on the construct of successful ageing

In existing literature on successful ageing, various similar terms, such as "healthy ageing", "productive ageing", "ageing well", "active ageing" and "robust ageing" have often been used interchangeably.

The term "successful ageing" was presumed to be originated from Havighurst, who was often recognized as the first researcher to use "successful ageing" to describe the process of ageing well and he associated it with maximal life satisfaction and happiness[12].   Subsequently, Rowe and Kahn[13] (1987)

brought increased attention to the study of successful ageing by recommending that a distinction should be made between normal and successful ageing. As opposed to 'average" or "normal" agers, successful ageing was the positive extreme of normal ageing and refers to individuals with better than average characteristics such as showing little or no age-related decrements in physiological function in old age[13]. Consequently, successful ageing was strongly associated with health and function; and this emphasis on biomedical components is still prevalent till today in successful ageing research. Early research variously defined successful ageing as narrowly defined uni-dimensional biomedical, psychological or social functioning constructs, using theories from biomedical, psychology, or sociology disciplines [14].

Traditionally, biomedical models of successful ageing were the most widely used and published and typically focused on the freedom from disability/disease, maintenance of physical and cognitive functioning and life expectancy[15]. Sociological models of successful ageing based on continuity and other theories emphasized social functioning, and view successfully ageing individuals as those maintaining high levels of social activities, interaction, and participation[16,2]. Psychological models of successful ageing variously focused on the possession of psychological resources such as adaptive and coping strategies, mastery, sense of purpose, resilience, positive outlook/mood, self-worth, self-acceptance, self-efficacy and personal growth to cope with the challenges of the ageing process[15,17,18].

However, such uni-dimensional constructs of successful ageing used predominantly in earlier research are now deemed to be overly restrictive[19].

In concordance with the growing acknowledgement of older adults as a non-homogeneous group and the World Health Organisation's definition of health[20] as the presence of complete physical, mental and social well-being, successful ageing is now perceived as a multi-dimensional construct comprising of multiple components[18] from various biomedical, psychological or sociological disciplines. Hence, more than the mere absence of disease, successful ageing is defined by all aspects of wellbeing including mental wellbeing, maintenance of an active lifestyle, good supportive relationships, and life satisfaction.

1.4 Multidimensional construct of successful ageing

Although there is now general consensus that successful ageing is a multidimensional construct that extends beyond biological functioning and spans across various different dimensions[21,22], several problems remains with using multidimensional models of successful ageing. First, few models are truly multidimensional[23] and most multidimensional models were objectively constructed without incorporating subjective input from older adults. Apart from biomedical component which was included in almost all multidimensional models of successful ageing, the inclusion of other psychosocial components were lesser and varied widely[24]. In particular, the failure to incorporate subjective input and continued emphasis on biomedical components by researchers has been highlighted. Limited available qualitative studies indicated that older adults placed greater emphasis on psychosocial factors as being core to successful ageing, with lesser emphasis on biomedical factors such as genetics, absences of diseases/disability, functioning, longevity and independence[25,26].

Therefore, contrary to researchers' objective perceptions, older adults seemed to perceive social functioning and psychological components such as behavioural adaptions to disabilities and life changes as more essential to successful ageing than biomedical components such as absence of physical disabilities or illness [17,27,25,26,18]. These comparisons highlighting discrepancies in perceptions toward successful ageing between researchers and older adults themselves provided evidence that most multidimensional models of successful ageing are restrictive and may be over-estimating or undermining certain domains. There is a need for multidimensional models of successful ageing to be constructed with broader and less restrictive components as well as to incorporate subjective perspectives from older adults themselves.

1.5 Global construct of successful ageing

Since multidimensional models of successful ageing tend to be restrictive and lack subjective input, an alternate way to counter the narrowness of a multidimensional construct is to view successful ageing as a broad global construct and perceive it as a holistic entity. Because it is a holistic entity, it is arguable that a global construct of successful ageing is capable of capturing subjective perceptions of successful ageing, which may be restricted by pre-determined objectively-defined criteria as used in multidimensional models. Global construct of successful ageing allows older adults to determine whether they are ageing successful or not using their own criteria. Therefore, successful ageing as a global construct may be measured more accurately and easier than multidimensional models of successful ageing. This is because a global construct of successful ageing may defined and measured subjectively

by older adults themselves on a continuum using a self-rating scale and is therefore unrestrictive and sensitive in capturing social-cultural variations. This approach in examining successful ageing as a global construct using self-rating scale has rarely been reported in past research[28,19].

1.6 Measurement: Multidimensional construct of successful ageing

Currently, the most common way of measuring successful ageing is by operationalizing multidimensional models of successful ageing. However, there is a lack of clarity on what measurements should be used for measuring the set of operationalized criteria in multidimensional definitions of successful ageing. Biomedical component which has been consistently included in almost all multidimensional models of successful ageing was measured with a wide range of criteria or indicators such as health behaviours, healthcare use, nutritional risk status, body mass index, balance and gait, hearing or visual impairments, physical health and function, absence of disability or disease, independent living, longevity, cognitive functioning or self-rated health[2,24]. Social-functioning component was typically measured with indicators assessing level of active engagement with life, social or productive activities, as well as level of engagement with friends and relative[2,24]. Psychological component was measured with a wide range of indicators ranging from positive adaptation, mastery/growth, optimism, self-acceptance and resilience[2,24]. Other indicators of successful ageing included measurements such as quality of life, life satisfaction/well-being and environment/finances[2,24].

There is currently no guideline on which indicators or measurements should be used to assess the components included in multidimensional models of successful ageing. Thus, the measurements used are often a reflection of the individual preferences of researchers[18]. However, it is evident that certain indicators of successful ageing such as absence of disease or chronic illness from the biomedical components are overly restrictive. Presence of diseases or illness are inevitable in old age for most individuals and yet criteria such as absence of diseases or chronic illness in most multidimensional models of successful ageing does not allow majority of older adults to be categorised as successful agers even if they fulfilled the criteria from other components. Therefore, measuring successful ageing using operationalized criteria from multidimensional models has limitations.

1.7 Measurement: Global construct of successful ageing

The constraints of measuring successful ageing using operationalized multidimensional models may be circumvented by using a self-rated single-item scale of global successful ageing. Currently, very few studies have used such a scale in measuring successful ageing [29,28,19] and no proper validation has been done.

Because global successful ageing encompasses a spectrum of underlying dimensions, a single-item analogue scale is arguably a sensitive tool in measuring subjective global successful ageing[2]. Analogously, a global measure of subjectively rated health using a self-rated scale, has been found in numerous studies to predict mortality independently of disease and disability among elderly persons[30]. Therefore, a self-rated single-item scale of global

successful ageing may also be a similarly important and valid measurement

construct.   In this regard, the choice of external criteria to validate subjective

successful ageing measure is also not straightforward. Nevertheless, many

studies have regarded life satisfaction and quality of life as outcome indicators

and criterion measures of successful ageing[31].

Since successful ageing is susceptible to socio-cultural influences, it is

important to capture socio-cultural variations when defining or measuring

successful ageing. Compared with the restrictiveness of multidimensional

models and measurements of successful ageing, a global model and

measurement of successful ageing may be superior in capturing socio-cultural

variations. This is because a self-rated single-item scale of global successful

ageing lies on continuum; therefore it is unrestrictive and is sensitive in

capturing implicit information and cultural variations that are otherwise not

extracted with criterion-based multidimensional constructs.

1.8 Ethnic and cultural dimensions in successful ageing

Successful ageing is influenced by culture. However, vast majority of

research traditionally focused on predominantly White Western population

and little emphasis was placed on cultural/environmental heterogeneity. The

failure to consider the socio-cultural context in which ageing occurs in was

evident and is problematic because ageing perceptions are partially a product

of an individual's social environment, and therefore views of ageing may

differ between racial groups[32]. Therefore, it is important to examine how

ageing perceptions and factors previously associated with successful ageing

are influenced by socio-cultural differences.

Indeed, the influences of socio-cultural and environmental factors on opinions and perceptions towards ageing have been documented. Cultural-specific components of successful ageing that were not included in existing multidimensional models of successful ageing were reported. In line with the distinction between East-Asians and Western cultural values of collectivism versus individualism, Taiwanese older adults expressed spirituality, family relationships and filial piety as important components for successful ageing. The positive influence of spirituality/religiosity on ageing well in later life was also documented in Singaporean Malay and Indian older adults [33] as well as Older Malaysian Malays[34].

Cross-cultural research revealed that perceptions of successful ageing varied with cultures, supporting the need to examine successful ageing in the context of peoples' cultures and values [35-37]. Given the cultural importance of family bonds and spirituality in Asian societies, psychosocial support in old age is shaped by moral values, such as respect and filial piety (a primary duty to respect and care for one's parents by every means that is only abrogated with same). Since ethnic influence on ageing is important and yet understudied, it is of great interest and relevance to explore successful ageing in multi-racial Singapore.

1.9 Overall objective and hypothesis of the thesis

There is currently a lack of research examining successful ageing among Singaporean older adults. It is important to understand successful ageing in Singapore because successful ageing should be examined within the socio-

cultural context it occurs in, especially in Singapore whereby there are three main racial groups.

The overall objective of this thesis is to explore multidimensional and global constructs of successful ageing among community-dwelling older adults aged 65 and above. Although it is predicted that both multidimensional and global constructs of successful ageing will be validated, I hypothesised that global construct of successful ageing will be better due to its broad entity that allows the incorporation of subjective perceptions. Therefore, global construct of successful ageing is sensitive in capturing implicit information and cultural variations that are otherwise not extracted with criterion-based multidimensional models, which are more restrictive.

Accordingly, several related but independent studies were conducted. First, I evaluated the validity of a broad multidimensional model of successful ageing (study I). Next, I examined the validity and reliability of a self-rated single-item scale of global successful ageing (study II). Cultural and subjective perspectives on successful ageing will also be examined using both quantitative and qualitative data (studies III and IV). For ease of reference, they are referred to as Study I, Study II, Study III and Study IV respectively throughout the thesis.

The following research questions were examined in each of studies:

1.9.1 Objective and hypothesis: Study I [Quantitative design with cross-sectional and longitudinal data]

Study I: To evaluate the validity of a broad multidimensional model of successful ageing in Chinese older adults in Singapore. This broad multidimensional model was formulated based on the World Health Organisation's definition of health[20] as the presence of complete physical, mental and social well-being. Therefore, successful ageing is defined by all aspects of wellbeing, including mental wellbeing, maintenance of an active lifestyle, good supportive relationships, and life satisfaction. Furthermore, restrictive criteria from the biomedical component such as absence of diseases or disabilities were not used in my multidimensional model. Predictors of successful ageing would also be examined. The multidimensional model of successful ageing examined in this study comprised of four components: physical health and well-functioning; cognitive and emotional well-functioning; high social functioning and active life engagement; high life satisfaction (to be classified as successful agers, criteria from all four components have to be fulfilled).

(i)   I hypothesized that my broad multidimensional construct of successful ageing comprising of four dimensions would be associated concurrently with more socio-demographic, psychosocial, and behavioural determinants as primary independent or correlated factors. Since age, gender, education, socioeconomic status (living in larger higher end housing type, or having little or no financial difficulty in paying medical bills), high levels of social network and support (being married, living with

others, having someone to confide in, frequent visits or regular phone calls by children/relatives/friends, having someone to help when needed), religious/spiritual beliefs as a source of support/comfort, non-smoking, non-daily alcoholic drinking, healthy eating, physical activities and exercise, good sleep, having time for leisure and low nutritional risk have been shown to be determinants of successful ageing in previous research, this lead us to predict that my multi-dimensional construct of successful ageing would be associated with more demographic, environmental, psychosocial, and behavioural determinants, than those shown in studies that used restricted biomedical and physical functional definition of successful ageing.

(ii)   I hypothesized that successful ageing constructed as such would be associated with variables representing physical functional substrates of well-being, which have been described in previous research to be significant correlates of health. This prediction would demonstrate convergent validity of my multi-dimensional construct of successful ageing [cross-sectional].

(iii)   Since quality of life has been shown to be associated with successful ageing either as a correlate or outcome measure, I postulated that baseline successful ageing status as defined by this multidimensional model would be associated with subsequent better quality of life measured, which was measured both at baseline and two year later. This would demonstrate the predictive

validity of my multidimensional model of successful ageing [longitudinal].

1.9.2 Objective and hypothesis: Study II [Quantitative design with cross-sectional data]

Study II: To evaluate the construct and criterion validity of a self-rated single-item scale of global successful ageing that ranged from one to 10, in Singaporean older adults aged 65 and above. Reliability of the scale was also examined.

(i)   If global successful ageing encompasses a spectrum of underlying dimensions, it is hypothesized that ratings on the self-rated single-item scale of global successful ageing would be correlated with dimensional models of successful ageing. This prediction would demonstrate the construct validity of the self-rated single-item scale of global successful ageing. The five specific dimensional models refer to components associated with successful ageing: physical well-being (IADL, chronic illness and self-reported health status); mental well-being (CFQ, GDS-15 and self-reported mental health); social well-functioning (level of social/productive/individual activities, and amount of social support/ network from friends and family), psychological well-functioning (CD-RISC, LASA-D and LOT-R) and spiritual wellbeing.

(ii)   Since life satisfaction and quality of life bears semantic resemblance to successful ageing, I hypothesized that the self-rated single-item scale of global successful ageing would be a stronger predictor of life satisfaction and quality of life as compared to specific dimensional models of successful ageing. Life satisfaction and quality of life have been regarded as outcome indicators or criterion measures of successful ageing, therefore such prediction would demonstrate the criterion validity of the self-rated single-item scale of global successful ageing.

(iii)   I also examined the correlates of successful ageing and hypothesized that the self-rated single-item scale of global successful ageing would be associated with fewer correlates as compared to dimension-specific models. Given its unrestrictive, broad entity, I predicted that the self-rated single-item scale of global successful ageing would be independent of age, gender, education and health status.

(iv)   Lastly, I hypothesized that the self-rated single-item scale of global successful ageing would demonstrate good test-retest reliability by demonstrating strong correlations of scores between first and second time-points of administration of the scale, measured at two weeks apart.

1.9.3 Objective and hypothesis: Study III [Quantitative design with cross-sectional data]

Study III: The aim of this study was to examine gender and ethnic-based differences in subjective ratings on the self-rated single-item scale of global successful ageing and in relation to variables associated with successful ageing. In addition, ranking of important influential factors on successful ageing were also examined.

Variables examined were: ageing perceptions [self-perceived age, adaption to age-related changes, perceived ageism, expectations about ageing and living longer]; mortality salience and spirituality [thoughts and fear about death, religious and spirituality engagement]; health status [self-reported general health, number of chronic illnesses, self-rated mental health and limitations in physical functioning activities]; life satisfaction [overall life satisfaction, satisfaction with relationships and finances]; and views on important successful ageing factors [good genes, physical exercise, adapting well to change, financial stability, physical health, work satisfaction, healthy diet, positive outlook, mental activities, close friends/family and fulfilling marital/significant relationships]. . These variables were examined because they have been associated with successful ageing in the literature and I would like to examine how they are influenced by socio-cultural influences.

(i)   Since successful ageing is influenced by socio-cultural factors, it is predicted that there will be gender and ethnic differences in ratings on the self-rated single-item scale of global successful ageing and other variables associated with successful ageing.

(ii)   Due to cultural influences, it is also predicted that there would be different sets of predictors of self-rated successful ageing for different ethnicity and gender.

(iii)   Since previous research suggested older adults placed greater emphasis on psychosocial factors as core to successful ageing, with lesser emphasis on biomedical factors, I predicted that participants in this study would rank psychosocial factors to be more important.

1.9.4 Objective: Study IV [Quantitative design with data from focus group discussions]

Study IV: The objective was to further explore and understand the perceptions of successful ageing for Singaporean Chinese, Malay and Indian older adults aged 65 and above through in-depth discussions using focus groups. Participants were asked to discuss on the factors they think are important for successful ageing.

Summary

Since, research examining successful ageing within the local context is lacking, this series of studies potentially contribute valuable information regarding successful ageing among Singaporean older adults. In particularly, it is hopeful that this thesis would contribute evidence in better understanding both multidimensional and global constructs of successful ageing and its measurements. Study I and II would evaluate the validity of multi-dimensional and global models of successful ageing. Hopefully, these two studies would shed light on how the two constructs of successful ageing could

be used and the advantages and disadvantages of using multidimensional and global models.   In studies III and IV, the examination of socio-cultural influence could expand our knowledge and clarify factors that are important for the population as well as how they are important. Hopefully, studies III and IV would also provide additional information on important successful ageing dimensions, including those missing (not examined) in studies I and II.

CHAPTER 2

LITERATURE REVIEW

In this chapter, detailed literature review regarding successful ageing will be presented. First, because multidimensional models of successful ageing usually included components/indicators from biomedical, social-functioning and psychological models, these models and their underlying theories will be explained in details. Theories associating religiosity/spirituality with successful ageing will also be elaborated. Next, a review of multidimensional models of successful ageing and their components will be reported. Measurements of successful ageing using operationalised multidimensional definitions and self-rated scale will also be reviewed. Finally, socio-cultural studies of successful ageing as well as predictors of successful ageing will also be explained.

2.1 Biomedical models and successful ageing

Biomedical models of successful ageing are the mostly widely used and published in the literature and these dimensions are primarily based upon physical and mental health functioning[15]. Biomedical theories more or less defined successful ageing as the optimization of life expectancy, in the absence of physical and mental deterioration, which were deemed as barriers to ageing successfully[2,38]. For example, a Canadian population of health and ageing study defined successful ageing as having minimal interruption of usual functioning; needing no assistance nor having difficulty on a range of activity/mobility measures and little or no difficulty on measures of physical performance[39].

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2.1.1 Physical activity and successful ageing

The most frequently appearing component of successful ageing was disability and/or physical functioning[24]. Physical activity is an established determinant of successful ageing[40] and was generally measured by self-reported activities of daily living (ADLs) and less often with measures such instrumental activities of daily living (IADLs) or objective performance (e.g., grip strength)[24]. The importance of physical functioning on various aspects of health and well-being had been illustrated in the literature.

A number of longitudinal cohort studies have suggested that individuals who participated to a greater degree in physical activities were at lower risk of developing cognitive impairment or dementia [41-44], cardiovascular diseases[45], higher odds of living longer[46]. For example, the Honolulu-Asia Ageing Study[47] reported that participants who walked lesser had higher risk of dementia than those who walked more than 2 miles/day.

Participants who put in effort to maintain health and those with better self-rated health reported greater social, leisure and organizational involvement[48]. Meisner et al.[49] investigated the association between physical activity with successful ageing among 12,042 older adults aged 60 and above. Results showed that physical activity influenced overall successful ageing, such that greater level of physical inactivity were associated with an increased likelihood of reporting disease and disablement, low functional capacities, and being socially disengaged[49]. Sedentary behaviour was associated with lower odds of successful ageing among older adults as those who were least sedentary were 43% more likely to age successfully[50].

Von Faber et al. (2001) explored the meaning of successful ageing with a representative group of participants aged 85 and over and found that most elderly persons talked about health as important and was referred as the maintenance of basic functions (vision, hearing, and mobility) and the absence of life-threatening diseases, such as cancer[18].

2.1.2 Health behaviours and successful ageing

The relationship between health behaviours and successful ageing has been examined extensively. Lower body mass index[51,52] (BMI) was associated with better successful ageing, as was physical exercise[53,54]. In a 17-year longitudinal study, Britton et al[54] found early life exercise to be a predictor of successful ageing (free from major disease, good physical and mental function).

2.1.3 Cognitive functioning and successful ageing

Aside from physical health and activity, cognitive functioning was often included as a component in successful ageing definitions and was frequently measured with screening tests [e.g., Mini-Mental State Examination] or self-reported memory functioning[24].

Studies have shown that as age increased, participation in intellectually stimulating activities may sustain cognitive functioning, create a buffer against mental decline[55], or even promote longevity[56]. Those who participated in cognitively stimulating activities (e.g., reading newspapers, playing games) appeared to be at lower risk for developing cognitive impairment[57,58].

In qualitative research on successful ageing, older adults expressed a fear of cognitive decline because dementia was perceived as losing one's personality[18]. Participants felt lucky to have good cognitive functioning, and some tried to maintain cognitive levels through memory-training activities.

2.2 Social functioning models and successful ageing

Social functioning components included in successful ageing models often refers to the frequency engaged in physical, social, productive activities as well as social support and functioning. The mechanisms underlying social functioning and successful ageing can been explained by sociological theories.

2.2.1 Theories underlying social functioning and successful ageing

Sociological theories explained successful ageing with an adaptive management of changing social roles, status and relationships that accompany the ageing process. Earlier work in social gerontology included disengagement theory[59], and activity theory[60]. However, these theories have been largely discredited by researches due to lack of evidence and findings that many older adults desire to remain occupied and involved with society[2].

2.2.1.1 Continuity Theory

Building upon the activity theory is the more popular continuity theory of ageing which suggest that successful ageing should be regarded as a life-span development behaviour[16,2]. According to this theory, older adults maintain the same activities, social roles and relationships by adapting general adaptive principles learnt from past experiences[16].

Continuity theory used internal and external structures of consistency in explaining how individuals adapt to older age. First, remembered inner structure such as experiences, skills and preferences built up over the lifespan acted as a foundation for effective day-to-day decision making due to skills of mastery and competence. This is strengthened by familiar external structure of continuity such as physical and social environments as well as role relationships provides a stable self-concept and lifestyle for ageing successfully. Thus, both internal and external continuity enabled individuals to focus on and maintain their strengths while minimising the effects as normal aging occurs.

2.2.2 Physical, social, productive activities and successful ageing

Mechanisms underlying the relationships between activity, well-being, function, and mortality are important and have been explored. Activity theory suggests that participation in activities, particularly social activities provided opportunities for the role supports that are necessary in maintaining a positive self-concept. Similarly, productive activities, such as house-chores or volunteer work may provide individuals with a sense of usefulness and competence[61]. These activities may also instil a sense of control and mastery[62] which are positively related to life satisfaction[63]. Moreover, activities like gardening have a physical component and the benefits of physical activities have been documented extensively in the literature[64,65].

The importance of activity in ageing successfully has been highlighted. Menec[66] examined the relationship between everyday social (e.g., visiting relatives), solitary (e.g., collecting hobbies) and productive (e.g., volunteer

work, gardening) activities and successful ageing (well-being, function and mortality) in older adults over a six-year longitudinal study. Findings showed that greater overall activity level was related to greater happiness, better function and reduced mortality six years later. In particular, social and productive activities were positively related to happiness and mortality. Engaging in various social and productive activities was also related to a reduced in functional decline. Participants who engaged in solitary activities also reported higher level of happiness 6 years later than those who did not.

Activity levels measured in terms of the number of activities individuals engaged in or the frequency with which they engaged in a range of activities, was shown to be positively related to well-being in a number of studies[67,68,63]. Factors such as satisfaction with life[69], sense of belonging to community[70], and loneliness[71] were found to be associated with physical inactivity. Furthermore, studies also showed that activity predicts functional and cognitive status[72], incidence of Alzheimer's disease[73,58], and functional health[74].

2.2.3 Social support / functioning and successful ageing

Having positive social relationships were documented to have substantive contributions to improved health and longevity[75], as well as reducing risks of dementia and frailty[76,77]. There is also robust evidence for strong detrimental effects of negative exchanges (e.g., demanding or neglectful social exchange) and in fact, the impact of negative social contact keeps up with many other well-known risks in the ageing process. Negative social interactions, such as

criticism or rejection resulted in diminished subjective health and lowered functionality in domains such as activities of daily living[78,79].

A number of studies indicated that social support exerts a strong protective influence on ageing well in later life[52]; for example, Montross et al. (2006) showed that self-ratings of successful ageing was tied very closely to the number of friends that an individual had as well as greater activity and participation in social events[28]. Furthermore, the quality of social contacts proved to be more important to elderly persons than the quantity of contacts. This selection bias may be explained by the socio-emotional selectivity theory in which, emotional regulation becomes a central goal in ageing[80,81]. Accordingly, social activity reductions in the elderly are grounded in the choices of the older individual, who with diminished energy and awareness of anticipated ending chooses social relationships that will be most satisfying[80,81].

The importance of social functioning factors was further supported in qualitative research. Von Faber et al. (2001) found that majority of older adults perceived social functioning as essential for well-being and successful ageing[18]. In particular, social contacts were perceived as coping mechanisms in avoiding loneliness and while social activities might decrease due to physical dysfunction, social contacts continued to be important and influenced positive self-esteem.

2.3 Psychological models and successful ageing

Psychological components included in successful ageing models often focused on the possession of psychological resources such as adaptive and coping

strategies, mastery, sense of purpose, resilience, self-worth, self-acceptance, self-efficacy and personal growth[2].

The mechanisms underlying psychological components and successful ageing can been explained by several theories.

2.3.1 Theories underlying psychological coping and successful ageing

Psychological models of successful ageing emphasized the use of psychological resources for coping with the challenges of ageing over time and examples included using compensatory strategies, being adaptive and resilient[15,17,18]. Theories from this approach holds a more positive view of old age by seeing it as a period of opportunity and well-being, with retention, or development of the psychological resources to cope with life's challenges[2].

2.3.1.1 Theory of selective optimization with compensation (SOC)

With dwindling resources in later life, the ability to shape the environment in meeting demands and goals becomes important[82]. This theory proposed by Baltes and Baltes[83] draws on the concepts of variability and plasticity to describe the optimal psychological processes of successful ageing[84].

The theory of selective optimization with compensation assumes that life course consists of a changing script; and the key strategy to effective ageing is the ability to maximise the positive while minimizing the negative through selection, optimization, and compensation[85,86]. For example, if an older adult who used to be a professional runner finds that he no longer has the stamina, he will accept this limitation and adjust his goal by engaging in less taxing

activity such as brisk walking within shorter distance and subsequently derive

a sense of meaning from this adjusted goal. Therefore, successful agers would

be able to select fewer and more meaningful goals and activities, optimize

their existing abilities through practice and new technologies, and compensate

for the losses of some abilities by finding alternate ways to accomplish tasks.

It has been observed that older adults placed greater emphasis on flexible goal

adjustment[87,88] and that secondary control processes in ageing helped the

older adult deal with losses and to selectively focus on important goals[89,90].

This theory was used in the Berlin Ageing Study[91], which followed a cohort

of older adults and data collected demonstrated that those who used SOC as

strategies in life reported higher levels of subjective well-being, positive

emotions and absence of loneliness, which were used as outcome indicators

for successful ageing[86].

2.3.1.2 Stress process theory

The stress process theory assumes that the reason why individuals exposed to

similar stressors do not necessarily suffer the same deleterious health

consequences is because resources of coping repertoires and self-concepts

such as a high sense of control, sense of mastery over life and self-esteem

served as protective barriers[92]. Mastery is a conviction that one is able to

control the important circumstances that are currently impinging on one's

life[92] by promoting coping ability and increases resistance to the adverse

effects of challenges in life, while low perceived control increases feelings of

powerlessness. Having a sense of mastery has protective effect on health and

well-being. Research demonstrated that mastery is a mediator between

stressors and mental health[93,94]; moderates the adverse impact that difficult condition would otherwise exert[95,96]; and has a positive relationship with well-being in the presence of stressors[94].

2.3.2 Psychological adaptation / coping and successful ageing

Ageing is associated with the depletion of physiological, social and temporal resources and involved a multitude of biological, social and psychological changes[97]. These changes, along with concomitant diseases, represent a significant source of stress for the elderly.   The ability to use psychological strategies to cope and adapt to these changes had been shown to be essential for successful ageing.

Von Faber et al. (2001) found that the ability to adjust to circumstances, counting one's blessings like social contacts, and focusing on gains instead of losses were said to be crucial for ageing successfully[18]. For example, participants stated that acceptance and adaptation to physical limitations (e.g., to the slowing of pace and the diminishing of strength) are essential in maintaining a feeling of well-being[18]. Coping abilities such as being content despite one's limitations were found to be important for psycho-cognitive functioning.

Holahan and Velasquez[48] found that emotional regulation and adaptation was the most frequently mentioned strategy used for coping with the challenges of ageing. Participants mentioned deliberate efforts to handles negative emotions, as well as efforts to maintain positive mood. These results are in agreement with contemporary theories of successful ageing that stress cognitive or behavioural strategies to adjust to age-related declines in later life.

2.3.3 Psychological resilience and successful ageing

Resilience is a construct that connotes the maintenance of positive adaptation by individuals in the context of significant adversity. Resilience was used to explain the ability of some elderly in maintaining a sense of well-being despite the aversive losses associated with ageing[98,99]. A handful of studies[100-103] have assessed resilience in older people.

In these studies, measures of resilience was found to be positively related to self-rated health, emotional and psychological well-being, cognitive and physical functioning, successful ageing, as well as longevity[104,105,101,103,106]. Psychological resilience has also been shown to be associated with better recovery from illnesses[107] and moderated the adverse psychological effects of chronic illnesses and functional impairments among the elderly[108,109].

Therefore, psychological intervention approaches may have a more long-lasting impact on successful ageing than physical health-based approaches[15].

2.4 Religiosity / spirituality and successful ageing

Religiosity or spirituality was found to be an important factor for successful ageing in some studies [35,33,34] and yet this component has rarely been included in successful ageing models. Researchers proposed that adding a positive spirituality dimension into Rowe and Kahn's three-factor model of successful ageing will strengthen it as a framework for promoting successful ageing interventions[110].

The terms "religion" and 'spirituality" have often been used interchangeably when evoking ideas concerning one's relationship to the sacred or to other

forces outside the physical world[111]. Usually the term "religion" refers to observable, measureable beliefs or rituals that are associated with a specific formal, orthodox group or belief system organized around some sacred dimension[110-112]. In contrast, spirituality tends to be less visible, more intrinsic, therefore; one can be spiritual in both belief and behaviour yet have no ties to an institutionalized system of belief and ritual[110,111].

One of the shortcomings of the current literature on religion/spirituality and health is that there is a virtual lack of information about minority religions which reduced the generalizability of the past research to non-whites or non-Christians. There remains much to be discovered about religion/spirituality and ageing. Past research is severely limited in its generalizability, because longitudinal data, cross-cultural comparisons, and studies of minority groups and faiths are scarce[112].

2.4.1 Mechanisms underlying religiosity/ spirituality and successful ageing

The positive influence of religiosity / spirituality on ageing well may be explained through three plausible ways: (1) positive health behaviours or practices; (2) social integration and support; and (3) sense of comfort.

2.4.1.1 Association between religiosity/ spirituality and positive health behaviours or practices

The positive influence of religion on well-being may be owed to the fact that religious people engaged in more health behaviours[111]. For example certain denominations forbid certain behaviours that lead to poor health outcomes (e.g., Mormons are taught to abstain from smoking tobacco products). Studies

have shown that members of these groups generally have lower rates of cancer mortality and higher life expectancies[113,114]. A second explanation was that being religious in both practice and belief promotes regularity in lifestyle, which results into healthier patterns of living[111]. This was documented in several studies showing that regardless of the denomination to which one belongs, higher levels of religious practice are associated with healthier lifestyles such as quitting smoking habits[115], increased physical activity, lower levels of alcohol consumption[116] and suicidal thoughts.

2.4.1.2 Association between religion and social integration or support

A second explanation for the positive influence of religion on successful ageing was that religion provides an avenue in maintaining social integration by setting individuals within social networks filled with people sharing similar beliefs, backgrounds or behaviours[111]. It is believed that those who participate in religious services on a regular recurring basis are surrounded by others who share similar beliefs and this integration might serve to lift spirits, motivations and help to stave off doubt and reduce stressors[111]. Furthermore, regular interaction with religious group serves as a tool for regulation and helps congregation members adhere to the lifestyles prescribed by the religious group and thus may have important consequences for well-being[111].

Some evidence demonstrated that those who are more religious tend to have larger social networks and are more likely to be in contact with those in their networks. Researchers found that individuals who were more religiously active had more non-kin network ties and higher levels of telephone and in-person contact with their family and friends[117]. In a study focusing on older

adults, Idler and kasl[116] showed that those who attended church regularly reported more close friends and higher levels of contact with friends and family. Not only do higher levels of religious activity improved the quantity of social relationships and contacts, it also appears to improve the quality of those relationships. Ellison and George[117] showed that religiously active people reported more positive perceptions of their social ties.

Social networks are important for well-being and evidence showed that religious individuals tend to receive higher levels of both instrumental and emotional social support[118,119]. More importantly, those who attend services more regularly have greater perceptions of the availability of support[120]. For older adults who must adjust to important transitions in later life, such as retirement or bereavement, the availability of social support could prove crucial for maintaining overall levels of health[111]. Clergy and congregation members are often cited as important sources of support for those with cancer[121]. Being set within such a network may produce better health outcomes not only through the perception that support would be available if needed, but also through the actual provision of support[111].

2.4.1.3 Association between religion and comfort

Finally, besides support networks, religious involvement can also help people get through problematic circumstances through religious coping[111]. Because of the numerous life transitions, changes in health and losses of family and friends, older adults will usually have much to deal with in terms of life problems and the importance of the comfort role of religion for people in later life was noted by Koenig[122]. For example, religious beliefs about the afterlife

often can help bereaved older adults adjust to the loss of a loved one and thus lead to better functioning and quality of life[111]. Death anxiety tends to be less severe among older adults with strong religious faith[122].

Koenig and collaborators examined the association between 21 types of religious coping and a host of physical and mental characteristics[123]. They found that types of religious coping associated with positive mental health included reappraising God as benevolent, collaborating with God, seeking a connection with God, and seeking support from clergy or other church members. These coping behaviours were strongly related to stress-related growth, enabling patients to experience greater psychological growth from these stressful health problems.

The most helpful varieties of religious coping were those associated with a perception of God as spiritual support, particularly relating to feelings of God as loving and should be trusted to care for one's burden[124]. Coping behaviours that focused primarily on the self (self-directed coping) without depending on God, were related to greater depression, lower quality of life, and significantly lower stress-related growth. Overall, people who used religion to cope often do so in terms of trusting in God, praying, and seeking help and strength from God[111]. These findings suggested a positive association between religion and reduced levels of psychological stress and could point go physiological consequences that impact physical health as well[110].

Similarly, Mehta[33] (1997) argued that among Indian and Malay ethnic groups living in Singapore and belonging to Hindu, Christian, and Islamic groups,

religious values and beliefs can provide meaning and integration that enhances the process of adjusting to later life by providing a means of meeting the emotional and esteem needs of the elderly.

2.4.2 Evidence: religiosity / spirituality and successful ageing

Religion or spirituality appears to have positive effects on health. Stronger religious convictions have strong links to physical and mental health[110,125]. Regular religious activity was associated with an improvement in subjective states of well-being[126], a reduction in levels of depression and distress[127], lower rates of mortality[115] and an longer life-span[128-131]. Positive spirituality fosters active engagement in life, through religious and or community activities, prayer, meditation and other practices[110]. Several studies have also shown a positive association between religious involvement and better adaptation to medical illness such as cancer[132,133].

Religiously committed persons are less likely to engage in health behaviours like smoking and alcohol use[134]. Studies of mental health and substance abuse have shown that religious activity buffers against the negative effects of physical illness or stressful life events[135]. Level of religious commitment also predicts speed of recovery from depression regardless of initial depression severity[136]. The vast majority of such studies do find that religious involvement is associated with greater well-being and life satisfaction, greater purpose and meaning in life, greater hope and optimism, less anxiety and depression, more stable marriages and lower rates of substance abuse[134].

Religious activity was also associated with higher levels of functional health among older adults. Studies examining the associations between religious

activity and disability over a three-year and 27-year follow-up period found that religious activity was associated with lesser disability over time, even after adjusting for baseline disability and other factors[137,138].

2.5 Predictors of successful ageing

From the existing literature, a number of predictors were examined for their relationship to successful aging.

Out of all investigated predictors, younger age was the most consistent predictor of successful ageing as demonstrated by the review conducted by Depp and Jeste[24] in which 13 out of 15 studies reporting a significant association with younger age to the probability of ageing successfully.   In majority of the studies, age was significantly associated with successful ageing, with prevalence declining sharply with age from over 25% of 70 year-olds to 6% of 80 year-old[139-141].

From the meta-analysis report[24], other strong predictors of successful ageing were absence of arthritis (three out of four); hearing problems (four out of four); better activities of daily living (five of five), and not smoking (nine out of 12). Moderate support was found for higher exercise/physical activity level (six out of 10), better self-rated health (seven out of 10), lower systolic blood pressure (two of four); fewer medical conditions (four of seven); global cognitive function (five of seven); and absence of depression (five of seven).

Although some findings indicated that education is one of the most dominant early influences of successful ageing whereby higher levels of formal education distinguished successful participants from others[52], the meta-

analysis found limited support for education (four of nine) as a significant predictor[24].

There were limited evidence found for higher income (four of nine); being currently married (one of 10), and of white ethnicity (two of seven)[24]. The effects of gender on successful ageing were also inconsistent. The meta-analysis revealed that 50% of the longitudinal studies reviewed found that women were more likely to experience successful ageing than men[24].

Predictors of successful ageing varied widely and this may be related to the subjective nature of successful ageing. Because successful ageing is influenced by socio-cultural factors, it is likely that predictors vary depending on the context successful ageing occurs in. Therefore, there is a need to examine successful ageing, including its predictors in Singapore since no relevant research was found.

2.6 Multidimensional models of successful ageing: review

Successful ageing is generally regarded as a construct comprising of multiple components; therefore empirical studies typically defined and measured successful ageing using multidimensional models. Literature review indicated that all multidimensional models of successful ageing spans across biology, psychology and social perspectives. Therefore, successful ageing models typically included components from biological, sociological-functioning and psychology models. However, there was a wide variation regarding the types and numbers of components that were included into the multidimensional models as none of the studies used the exact same components in defining the concept of successful ageing [2,24,22]. Specifically, the number of components

included in multidimensional models of successful ageing ranged from as little as three [142,141,19] to as many as seven[28].

Unanimously, almost all studies included physical functioning as one of the criteria for successful ageing [2,24,22]. Further examinations reviewed that the most frequent appearing component was disability or physical functioning[142,143,28,141], followed by cognitive functioning[143,141], social/productive engagement[142,28] and independent living[24,142,143,141]. The next most frequent component was life satisfaction/well-being[28], absence of disease/illness[28]. Components of positive adaptation, mastery/growth and positive mood were included rarely[143,28]. Therefore, when constructing multidimensional models of successful ageing, researchers continued to place more emphasis on biomedical components and lesser attention was given to psycho-social components.

This emphasis on biomedical components was also noted in a review paper based on 28 studies using operationalized definitions of successful ageing, Depp and Jeste[24] (2006) identified 29 different definitions from these published papers. They also found that apart from disability/physical functioning criterion which was included in almost all definitions (n=26), no other single factor appeared in more than one-half of the definitions[24]. Cognitive functioning was included in 13 of the definitions while the inclusion of psychosocial domains were lesser and more varied[24].

Similarly, Bowling[2] (2007) conducted a review of existing studies of successful ageing and found wide variability in successful ageing definitions. Out of 18 longitudinal studies included in the review, eight contained both

biomedical and psychosocial domains, six were entirely psychosocial, and 4 contained purely biomedical domains[2]. Of the 20 cross-sectional surveys, half were entirely psychosocial domains, four were entirely biomedical and six included both domains[2].

Given the large body of evidence supporting the positive influence of physical health, activity and cognitive wellbeing on ageing well, it is not surprising that biomedical components were included in almost all multidimensional models of successful ageing and was given the most attention by researchers. However, emerging qualitative studies suggested that the importance of biomedical components may have been overestimated. Qualitative studies revealed that older adults placed greater emphasis on psychosocial factors as being core to successful ageing, with lesser emphasis on factors such as genetics, absences of diseases/disability, functioning, longevity and independence.

Reichstadt et al[26](2010) interviewed 22 independent living community-dwelling older adults on what they think constituted successful ageing. They found that participants viewed successful ageing as a balance between self-acceptance and self-contentedness on one hand and engagement with life and self-growth in later life on the other. These emphases on psycho-social domains for successful ageing were also reflected in other qualitative studies. For example, in another focus group study, older adults perceived attitude/adaptation, security/stability, health/wellness, and engagement/stimulation as important contributing themes for successful ageing[25].

These studies[17,27,25,26,18] suggested that contrary to objective criteria thought to be important by researchers, older adults seemed to perceive social functioning factors and psychological and behavioural adaptions to disabilities and life changes as more essential to successful ageing as compared to absence of physical disabilities or illness. This disparity between objective and subjective perspectives on successful ageing is further demonstrated when measuring the prevalence of successful ageing.

2.7 Prevalence of successful ageing: self-rated and objectively measured using researcher-defined criteria

Objectively constructed multidimensional models of successful ageing have been criticized for failing to incorporate subjective perspectives of older adults themselves[28]. Furthermore, few studies have questioned older adults themselves on what they are think are essential elements of successful ageing or used subjective ratings for comparative purposes. Quantitative research comparing objective and subjective perceptions on successful ageing found that older adults tend to rate themselves as 'successful agers' during subjective appraisals, whereas fewer would have been regarded as ageing successfully when objectively-defined criteria were applied [28,19]. Many older adults still considered themselves to have aged successfully despite limited functioning[18], this is also known as "disability paradox"[144].

Strawbridge, Wallhagen and Cohen[19] (2002) compared operationalised multidimensional model of successful ageing with subjective perspective of successful ageing by asking participants how strongly they agree or disagree with the statement "I am ageing successfully (or ageing well)". Findings

indicated that 50.3% (n=436) of older adults considered themselves as ageing successfully whereas only 18.8% (n=103) of these individuals would be classified as successful agers when evaluated by Rowe and Kahn's 3-factor model of successful ageing (absence of disease and disability, active engagement with life, and maintaining high physical and cognitive functioning). Further examinations revealed that out of the 163 participants classified as ageing successfully according to Rowe and Kahn's criteria, 60 self-rated themselves as not ageing successfully. Similarly, out of the 704 participants classified as non-successful ageing by Rowe and Kahn criteria, almost half (n=333) self-rated themselves as ageing successfully. Whereas Rowe and Kahn limited successful ageing to those with no chronic conditions, 43.0% (n=246) of those with one chronic condition considered themselves to be ageing successfully; for two conditions the figure was 35.0% (n=80) and for three or more it was 16.7% (n=36). Similar results were found for physical and cognitive functioning, whereby 35.5% (n=338) of those not physically or cognitively fit still considered themselves to be ageing successfully.

Similarly, Montross et al.[28] (2006) asked 205 participants to report self-perceptions of successful ageing on a 10-point scale and more than 90% of participants rated themselves as ageing successfully (with a score of 7 or more), and yet only 5% would have met all three criteria for successful ageing proposed by Rowe and Kahn. Out of the study sample, only 15% of participants met criteria for absence of physical illness and only 28% reported absence of any limitations in basic physical health. However, majority of these participants met research criteria for independent living, and

mastery/growth, positive adaptation, life satisfaction/emotional well-being, and active engagement with life.

Findings from these studies attest to the restrictiveness of multidimensional models of successful ageing, pertaining to both construction and measurement aspects. Furthermore, although disability/physical-functioning or absence of illness was frequently included in successful ageing models, results from these studies demonstrated that the use of biomedical indicators of successful ageing such as absence of diseases/illness is overly stringent. Literature review showed that studies using operationalized multidimensional models of successful ageing in measuring prevalence of successful ageing varied greatly, from 5% to 46%[143,28]. Furthermore, unlike self-rated measurements, majority of research participants were not classified as ageing successfully according to criteria from multidimensional models of successful ageing[24]. Biomedical components such as physical health and functioning are important for ageing well as evidenced by the large body of evidence reporting association between health and wellness. But clearly, there is a call for less stringent criteria to be used as indicators for biomedical components in multidimensional models of successful ageing as well as a broader multidimensional model. This is evidenced by limited available qualitative and quantitative research indicating that significant numbers of older adults with chronic illness/diseases still considered themselves to be ageing successfully[28,25,19].

Considering that successful ageing is subjective and that most multidimensional models were objectively constructed and remained restrictive, a self-rated scale may be a better choice of measure in assessing prevalence of successful ageing. A self-rating is rarely used in measuring

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successful ageing and only the two studies illustrated above assessed prevalence of successful ageing with a self-rating scale[28,19] . However, both studies did not specifically attempt to validate the self-rating scale as a measurement of successful ageing. Self-assessment is not meaningless because any successful ageing definitions/models must be relevant to older adults themselves. Therefore, further studies examining the validity and reliability of using a self-rated scale in measuring successful ageing are required.

2.8 Other outcome measures of successful ageing

Besides subjective ratings and researcher-defined criteria from operationalised multidimensional models, life satisfaction and quality of life have been used as outcome measures of successful ageing.

2.8.1 Life satisfaction and successful ageing

Life satisfaction has been used interchangeably as either a predictor[141,145] or regarded as a component of successful ageing[146]. Although there is some lack of consistency about the status of life satisfaction, the positive relationship between life satisfaction and successful ageing is clear.

Support for the association between life satisfaction and successful ageing was demonstrated in a qualitative study on which the researchers found that for most elderly, current life satisfaction was equivalent to successful ageing[18].

2.8.2 Quality of life and successful ageing

Quality of life has long been used as an outcome measure in the evaluation of a diverse range of health and social care interventions[15]. Similar to life

satisfaction, quality of life has been used as an outcome indicator of successful ageing by many investigators[15,17].

The use of life satisfaction and quality of life in successful ageing research is prevalent because they are indicators of wellbeing, which is similar to the concept of successful ageing. Further works may be required to better understand of their associations but currently, life satisfaction and quality of life appeared to be appropriate outcome measures of successful ageing.

2.9 Ethnic and cultural dimensions in successful ageing

Majority of existing research have traditionally studied Western populations with little emphasis placed on cultural/environmental heterogeneity, thus failing to consider the socio-cultural context in which ageing occurs. This is problematic because ageing perceptions are partially a product of an individual's social environment, and therefore views of ageing may differ between racial groups[32].

The influences of cultural and environmental factors on opinions and perceptions towards ageing have been documented. The importance of socio-environmental influences on ageing perceptions was illustrated by a study which found that China Chinese and deaf Americans hold more positive views of ageing as compared to healthy American seniors[147].

The limited available cross-cultural research on successful ageing supports the importance of socio-cultural dimensions as successful ageing was demonstrated to be susceptible to cultural influences. Iwamasa and Iwasaki (2011) explored the concept of SA with Japanese American seniors and found

the existence of both culturally-universal (e.g., physical health) and culture-specific elements (e.g., endurance, not complaining)[35]. The collectivistic Japanese cultural value of adjusting one's needs to maintain group harmony rather than the individual emphasis on expressing one's need was emphasised[35]. This is in line with cultural distinction between East-Asians and Western cultural values of collectivism versus individualism.

Hsu (2007) explored the concept of successful ageing with a group of elderly Chinese Taiwanese and found evidence of cultural differences as compared to Western research literature[84]. Several cultural-specific factors considered as important for successful ageing were expressed by the participants. For example, besides from health and spirituality, Taiwanese older adults also indicated family relationships such as the concept of filial piety as important components for successful ageing. These cultural-specific components attest the importance of studying successful ageing within socio-cultural context.

The importance of not using Western templates to study successful ageing has also been further demonstrated in the handful of research looking at racial groups. From interviews and focus group data, Mehta (1997) found that positive influence of religion and religious beliefs had tremendous impact on the adjustment process in late life for Singaporean Malay and Indian older adults[33]. In another qualitative study exploring the concept of healthy ageing in older Malaysian Malays, spirituality emerged as a fundamental factor to ageing well in later life[34]. Although the component of spirituality was argued to have positive influences on successful ageing, it has mostly been neglected in the literature and rarely included into the definitions[110,112].

For example, a large quantitative study[148] examined successful ageing in Malaysian older adults using a multidimensional model measured with criteria of: avoidance of chronic disease and physical functioning difficulty, and maintenance of good psycho-cognitive functioning. Findings reported prevalence of successful ageing as 13.8% (CI: 12.6-15.1) and that ethnicity was a correlate of successful ageing. Examinations of their findings revealed that majority of their participants (77%) did not meet criteria of psycho-cognitive dimension measured with indicators of: absence of depression/dementia; self-rated perceived health and self-rated quality of life. Furthermore, vast proportion of participants (75%) fulfilled physical functioning criteria measured with IADL and ADL. This is in contrast with findings reported by majority of studies examining successful ageing with predominantly Western population, whereby most participants met criteria of psycho-cognitive dimensions rather than physical functioning criteria[28,19].

The differences found could have resulted from the measurements that were used to assess similar dimensions; it could also very well have resulted from socio-cultural variations as successful ageing subjective in nature. It is also worth noting that cultural-specific elements such as religiosity/spirituality was not included in their model of successful ageing even though previous qualitative study with older Malaysian Malay participants reported that religion was a major factor for ageing well[34]. Due to socio-cultural influences on successful ageing, variations of measurements used to assess dimensions, and as well as the types of dimensions included in successful ageing, it is not surprising that the prevalence of successful ageing ranged widely. Therefore, comparing prevalence of successful ageing using research-

defined measurements/criteria is not meaningful across different populations. However, if successful ageing is measured on a continuum using a self-rated scale, it may be able to capture socio-cultural variations as it is not restricted by a set of criteria. Therefore, there is a need to examine the validity and reliability of using such a self-rated scale in measuring successful ageing. Since there is a lack of empirical research examining successful ageing in Singapore, there is also a need to explore the perception of successful ageing in Singapore, with both quantitative and qualitative studies. Since ethnic influence on ageing is important and yet understudied, it is of great interest and relevance to explore successful ageing in multi-racial Singapore. Furthermore, such information would be useful in constructing a better multidimensional model of successful ageing for older adults.

Summary

Most multidimensional models of successful ageing remained restrictive because they were objectively constructed by researchers. Components included in these multidimensional models varied and the inclusion of overly stringent criteria such as absence of diseases excluded majority of participants from ageing successfully. There is a need for multidimensional models of successful ageing to use less stringent biomedical criteria as well as including more psycho-social components. The restrictiveness of using researcher-defined criteria may be circumvented by using a self-rated scale of successful ageing due to its broad entity. Furthermore, socio-cultural influences on successful ageing may be captured by such a self-rating scale due to the continuum it lies on. However, self-rating scale of successful ageing has rarely been used and studies examining the validation and reliability of such a

scale are required. Since successful ageing is influenced by socio-cultural background, it is important examine the perceptions of successful ageing within the context it occurs. Especially in Singapore, whereby there are three main racial groups and yet no studies have specifically examined successful ageing with the local population.

Therefore, in view of these limitations, this thesis aimed to explore multidimensional and global constructs of successful ageing, including its measurements among community-dwelling older adults aged 65 and above. The validity of a broad multidimensional model of successful ageing with less stringent criteria will be examined. Next, the validity and reliability of a self-rated single-item scale of global successful ageing will be examined. Cultural and subjective perspectives on successful ageing will also be examined using both quantitative and qualitative data.

CHAPTER 3

This chapter reports on the methodology approach used in this thesis. This thesis used a mixed-methodology design so as to capture both objective and subjective perceptions on successful ageing. Both quantitative (studies I, II and III) and qualitative (study 4) data were used from three different research projects. Overview of the study design is shown in **Figure 1**.

3.1 METHOD: Study I

In study I, the validity of a broad multidimensional model of successful ageing with less stringent biomedical criteria was examined by using data from the Singapore Longitudinal Ageing Study (SLAS-1).

Pre-existing data was used and my role was to assist in data analyses. The main reason for using secondary data for analyses was because of its large sample size of community-dwelling older adults and the wide range of data collected. Furthermore, longitudinal data on variables of quality of life was available for analyses.

3.1.1 Research design

Data used in study I was obtained from the Singapore Longitudinal Ageing Study (SLAS-1), which was a prospective community-based epidemiological cohort study of ageing and health among community-dwelling Singaporean older adults (Principal investigator: A/Prof Ng Tze Pin). Cross-sectional data was collected from 2003 to 2005 and participants were followed-up longitudinally two years after baseline assessment.

Ethical approval was given by the National University of Singapore

Institutional Review Board (see **Appendix 6**).

3.1.2 Population and sample

During recruitment and baseline data collection from September 2003 to

December 2005, participants were identified through door-to-door census

from older adult residents living in the five contiguous districts in South-east

region of Singapore. All residents aged 55 and above were invited to

participate in the study.

Those who were physically or mentally incapacitated to give informed consent

or participate were excluded. A total of 2,804 residents participated in the

study with an estimated response rate of 78.5%. All participants provided

signed informed consent and were reimbursed for their participation.

Participants who fulfilled eligibility criteria underwent an extensive series of

face-to-face interviews, assessments and tests that were conducted by trained

research nurses in the language (English or Mandarin) or dialect preferred by

the respondents.

3.1.3 Measurements

3.1.3.1 Assessment of multidimensional model of successful ageing

Successful aging was operationally defined in terms of overall and physical

health and well-functioning; cognitive functioning and emotional well-being;

social functioning and active life engagement; and life satisfaction. This broad

multidimensional model was formulated based on the World Health

Organisation's definition of health[20] as the presence of complete physical,

mental and social well-being.   Therefore, successful ageing is defined by all aspects of wellbeing, including mental wellbeing, maintenance of an active lifestyle, good supportive relationships, and life satisfaction. A summary composite measure created across the four dimensions to form a dichotomous variable. Participants would be classified as ageing successfully when they fulfilled the criteria from all four dimensions.

Measurements for each of the four dimensions of successful ageing are described below.

3.1.3.2 Assessment of physical health and functional well-being dimension

Two variables were used to define physical health and functional well-being domain. First, participants were asked to rate their own health status on a four point scale ("excellent", "good", "fair", "poor").   Only those who rated themselves as having 'good or excellent' health status were regarded as ageing successfully. Previous research showed that old adults who rated their health positively were more likely to rate themselves as successfully ageing[31,141]. Functional status was assessed with the instrumental activities of daily living (IADL)[149]. The IADL measured older adults' ability to live independently in the community and included eight items such as; making telephone call, travelling alone, shopping, preparing meal, housework, handyman work, own laundry, taking medication and managing money. The questions were rated from '1' (completely unable) to '3' (without help, able to do).   Functional independence was defined as not needing any help in one or more IADL tasks and this criterion for successful ageing have been used in previous research[143,66].

3.1.3.3 Assessment of cognitive function and emotional well-being dimension

Two variables were used to assess this domain. First, cognitive well-functioning was measured by the performance on the Mini Mental State Examination (MMSE ≥26). The Chinese version of the MMSE which was validated in Shanghai[150] and in Singapore[151] was used. In this Chinese older population, the MMSE has been shown to have high sensitivity (96%) and specificity (84%) in identifying DSM IV criteria-based cases of dementia. The 30 items were coded as zero if participants refused or were unable to complete. Total score of MMSE ranges from 0 to 30, with higher score representing better cognitive performance. The MMSE has been used to measure cognitive functioning in previous successful ageing research[143].

Emotional well-being was measured by a paucity of depressive symptoms on the 15-item Geriatric Depression Scale (GDS <5), with the total score ranging from 0(no depressive symptoms) to 15 (severe depressive symptoms). Depressive symptoms were assessed using a cut-off of 5/6 on the locally validated Chinese version of the GDS, which has been shown to have high sensitivity and specificity in identifying major depressive disorder [152]. Participants with summed scores of 5 and above were considered to have depressive symptoms[152]. The association between absence of depression and successful ageing has been documented in the literature[153,19].

3.1.3.4 Assessment of social functioning and active engagement in activities dimension

Social functioning and active engagement in activities was assessed using a validated questionnaire[154] on the level of participation (often or at least once a week) in at least one of the social or productive activities, which includes 16 different social, recreational, civic activities, voluntary work, and paid employment or business, and domestic activities that are commonly performed by local older adults. Importance of activity participation in ageing successfully has been highlighted and such similar criteria was often used in previous studies[68,66,28].

3.1.3.5 Assessment of life satisfaction dimension

Life satisfaction was determined using a self-reported Life Satisfaction Scale comprising 4 questions which assessed the subjects' interest in life, happiness, loneliness, and general ease of living, which has been shown to predict mortality[155]. Respondents rated whether they find life 'interesting or boring', 'happy or sad', or 'easy or hard' on a 5-point Likert scale (such as 1=very interesting' to 5=very boring'), or 'lonely'' (3-point Likert scale: 1=not al all, 2=fairly lonely, 3=very lonely). The total summed score ranges from 4 to 18, with the lowest decile (score <11) indicating a positive life satisfaction. The association between life satisfaction and successful ageing has been well documented in the literature [2,146,18].

Other measures:

3.1.3.6 Assessment of Spirituality

Engagement in Spirituality was assessed by a single item that asked the respondent "to what extent are your religious or spiritual beliefs a source of support and comfort to you (1=not at all or little, 2=to some extent, 3=to a great extent)?" Higher score indicated more spirituality/religiosity engagement. This variable has rarely been studied in relations to successful ageing but its positive association with well-being and health has been reported[110,126].

3.1.3.7 Assessment of social network and support

Social network and support was assessed by six items: marital status (being married versus single, divorced, widowed), living arrangements (living with others versus living alone), having someone to confide with, regular visits at least once a week by children/ relatives/ friends in the last year, and regular phone calls at least once a week by children/ relatives/ friends in the past year, and having someone to help when needed (to some or a great extent)[156]. Good social network and support was determined by three or more positive responses to the six items. The positive contribution of social network and support on ageing successfully has been illustrated in previous studies[28,18].

3.1.3.8 Assessment of health behaviors

Measurements of health behaviors included smoking (current smokers versus ex-smokers and non-smokers) and alcohol drinking (daily drank at least 1 alcoholic drink), and the reported frequency with which the respondents 'watch what you eat', 'performed physical activities or exercises', 'have good sleep'', 'have time for leisure or relaxation' (never=less than once a month,

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sometimes= once a month or more but less than once a week, or often=once a week or more).

3.1.3.9 Assessment of health status

Health status was assessed by asking participants to report the presence in the 12 months prior to the interview of any of a list of 16 specified and other physician-diagnosed medical conditions. This was corroborated with their self-report of relevant surgical operations or procedures and physical identification of medications they currently took for their illnesses. Diagnoses of diabetes and hypertension were verified by the positive identification of medications, as well as fasting blood glucose and blood pressure. The number of chronic medical conditions was summed and categorized as 'none, one or two, and three or more'.

3.1.3.10 Assessment of health-care use

This included information on the frequency of hospitalization and physician visits in the 12 months period prior to the interview, vitamin and mineral supplements, and complementary and alternative medicine (CAM) use, determined by a detailed checklist of 'nutriceuticals'.

3.1.3.11 Assessment of nutritional risk status- Nutrition Screening Initiative (NSI)

Nutritional risk status was assessed by the Nutrition Screening Initiative (NSI) checklist[157] of ten questions (Yes/No) on behaviours and circumstances which increase the risk of poor nutrition (having an illness or condition that made me change the kind and/or amount of food I eat; eat fewer than two meals per day; eat few fruits or vegetable or milk products (less than once a day); having three or more drinks of beer, liquor or wine almost every day;

having tooth or mouth problems that make it hard for me to eat; don't always have enough money to buy the food I need; eat alone most of the time; take three or more different prescribed or over-the-counter drugs a day; without wanting, have lost or gained 10 pounds (4 kg) in the last six months; always physically unable to shop, cook and/or feed myself). The weighted summed scores were used to categorize participants with no or low nutritional risk (score of 0-2) or moderate-to-high nutrition risk (score of 3 or more).

3.1.3.12 Assessment of Body Mass Index (BMI)

Body mass index was calculated from weight and height (kg/m^2) and used to categorize participants as underweight (BMI <18.5), healthy range (BMI 18.5-22.9), overweight or obese (BMI ≥23.0), based on the revised cut-offs for Asian adult population, as recommended by the World Health Organization[158]. Height and weight was measured by using a portable Seca stadiometer (model 708, Vogel & Hake Hamburg, Germany.

3.1.3.13 Assessment of Balance and gait

The Performance-Oriented Mobility Assessment (POMA) of balance and gait was used to determine the mobility status of participants[159]. Sitting and standing balance (one leg, semi-tandem and tandem, heel, toe), as well as gait from walking down and back 10 meters were each assessed on a 3 point Likert scale (0,1,2). The summed score from the balance and gait scores (0 to 35), with higher scores denoting better mobility, was used.

3.1.3.14 Assessment of hearing and visual impairment

Hearing impairment was determined by the whisper test at arm's length[160], while visual impairment was defined by a logMAR score above 0.6 (equivalent to Snellen score worse than 20/80) in at least one eye[161].

3.1.3.15 Assessment of quality of life

Quality of life was measured at baseline and 2 year follow up using the Chinese version of the Medical Outcomes Study 12-item Short Form (SF-12)[162], which has been validated in Singaporeans[163]. Following manual instructions, scores of the 12 items were summarized in two weighted summary scales: the Mental Component Summary (MCS) score and the Physical Component Summary (PCS) score. Scores range from 1 to 100, with lower scores indicating poorer health status.

3.1.3.16 Assessment of socio-demographic background

Socio-demographic variables such as age, gender, ethnicity, marital status, living arrangement, educational level and housing type were also collected.

3.1.4 Data analyses

In study 1, to examine the validity of a broader multidimensional model of successful ageing, both baseline and longitudinal data were used for analyses. Baseline data from 1,281 Chinese participants aged 65 were used for cross-sectional analyses. Longitudinal analyses was performed for 856 participants who gave interviews at both baseline and follow-up two years later (31 died, 11 unfit for re-interview, 170 uncontactable and 204 refused). Only data from Chinese participants were used for analyses because the proportion of Malay

(n=54) and Indian (n=36) participants were very low in comparison to Chinese (n=1281) participants. Therefore, the decision was made to validate the broad multidimensional model of successful ageing only among Chinese participants. Data cleaning and data checking was conducted using descriptive statistics, scatterplots and histograms before analyses begin.

The successful ageing model with four dimensions was operationally defined as overall (participants required to meet criteria for all 4 dimensions to be classified as ageing successfully):

(i) Physical health and well-functioning;

(ii) Cognitive and emotional well-functioning;

(iii) Social functioning and active life engagement;

(iv) Life satisfaction.

First, to examine whether my broad multidimensional model of successful ageing would be associated with more socio-demographic, psychosocial and behavioural factors than those shown in studies that used restricted multidimensional models; successful aging status was analysed as the dependent variable using chi-square (dichotomous variable) and t-tests (continuous variable) that included demographic, psychosocial and behavioural variables as independent variables (age, gender, education, living arrangement, social network and support, financial status, spirituality, smoking, alcohol, watch what I eat, exercise, good sleep, leisure time, and nutritional risk). Subsequently, logistic regression models were used to identify independent factors of successful ageing.

Next, to examine the convergent validity of my multidimensional model, variables representing physical and functional substrates of wellbeing (self-reported chronic medical conditions/illnesses, number of medical conditions/illnesses, BMI, POMA scores, hearing and visual impairment, hospitalization, number of physician visits, use of multiple prescription drugs, use of complementary/alternative medicine and vitamin supplements), were analysed as correlates of successful aging using t-tests and chi-square tests. These variables have been described in previous research to be significant correlates of health.

Thirdly, predictive validity of the multidimensional model of successful ageing was investigated by comparing baseline successful ageing status with quality of life measured both at baseline and two years later. The association of baseline successful ageing status as independent variable, with SF-12 MCS and SF-12 PCS quality of life scores (measured at baseline and 2 years follow up) as the continuous dependent variable was analysed using analysis of variance. Adjusted means were calculated after controlling for other covariables (age, education, gender, medical comorbidities; longitudinal data was adjusted for length of follow-up, and their respective baseline score).

All analyses were carried out with SPSS statistical software 18.0 (SPSS, Inc, Chicago, Illinois) and the level for statistical significance was set at 0.05.

3.2 METHOD: Study II

In study II, the validity and reliability of using a self-rated single-item scale of global successful ageing (see **Figure 2**) was examined using cross-sectional data from the Singapore Study of Successful Ageing (SSOSA) research project [Note: study III also used data from the SSOSA project].

With permission from Professor Dilip Jeste, the questionnaire used in the SSOSA project was the Stein Research Institute for Successful Ageing Questionnaire, which was developed at the University of California, San Diego[29,28]. This questionnaire was used because it contained a self-rated single-item scale of global successful ageing that I want to validate, as well as a wide variety of other measurements relating to various aspects of successful ageing.

I played the role of a research assistant in this project and was the main coordinator. My responsibilities included: adapting the questionnaire such that it is suitable for local use; plan and instruct research nurses on standard administration of the questionnaire; conduct initial pilot study with 30 participants; coordinate fieldwork; recruit participants and administer questionnaire in the field together with research nurses; vet completed questionnaires; design SPSS template for data input; data entry for completed questionnaires; data management; data analyses; writing of manuscripts and regular communications with the principle investigator.

3.2.1 Research design

The SSOSA research project is a cross-sectional study survey that formed part of a second wave of the Singapore Longitudinal Ageing Study of Ageing and Health (SLAS-2), which is an ongoing prospective community-based epidemiological cohort study of ageing and health among community-dwelling Singaporean older adults (Principal investigator: A/prof Rajeev Kumar). Cross-sectional, baseline data was collected from 2008 to 2011.

Ethical approval was given by the National University of Singapore Institutional Review Board (see **Appendix 7**).

3.2.2 Population and sample

During recruitment and data collection for SLAS-2 project between 2008 and 2011, participants were identified through door-to-door census from older adults living in the South-Central and South-West of Singapore. All residents aged 55 and above were invited to participate in the study and 2800 community-dwelling older adults aged 55 were enrolled.

Participants in the SSOSA project were a subsample (N=500) of the SLAS-2 cohort who were aged 65 and above, and living in one locality (Bukit Merah) in the South-Central region. Eligible participants were those aged 65 and above and were Singapore citizens or permanent residents. Those who were physically and mentally too frail or unable to complete the interview, for reasons such as from post-stroke aphasia or dementia, were excluded.

Using power analysis, it was estimated that approximately 300 respondents would be required to have 80% power to demonstrate statistically significant

differences at alpha=0.05 (2 tailed). Target minimal sample size was set at 500 and the overall respondent rate was 88.6%.

Participants who fulfilled eligibility criteria underwent face-to-face interviews conducted in their preferred language or dialect by a multi-ethnic team of trained research nurses in a standardised method. All participants provided signed informed consent and were reimbursed for their participation.

Subsequently, for test-retest reliability of the self-rated single-item scale of global successful ageing, a convenience sample of 33 participants, aged 65 and above was recruited from existing SLAS-II database. The scale was administered to enrolled participants twice: at baseline and about two weeks later.

3.2.3 Measurements

Measurements used for Study II and III were obtained from the Stein Research Institute for Successful Ageing Questionnaire[29,28] which was adapted for local use **[Appendix 3]**. The questionnaire was translated into Chinese and Malay versions. Questionnaire items deemed culturally and linguistically biased were given their semantic equivalents in the local languages or dialects. Before recruitment started, the finalised questionnaire (English and Chinese versions) was administered by research nurses and I to a pilot group of 30 individuals randomly selected from friends and family. The purpose was to ensure that the items in the finalised questionnaire were understandable for the local context and to gain experiences in administering the questionnaire during face-to-face interviews.

Measurements from the Stein Research Institute for Successful Ageing questionnaire that were used for data analyses in study II are illustrated below.

3.2.3.1 Assessment of the self-rated single-item scale of global successful ageing

The validity and reliability of this single-item scale of successful ageing was examined in this study (**Figure 2**). Participants were shown an analogue scale that ranges from one to 10 (1=least successful to 10=most successful) and were asked to rate their own level of successful ageing. The item asked: Where do you rate yourself in terms of "successful aging?"[29,28]. This same scale was used in previous studies[29,28].

3.2.3.2 Assessment of dimensional measures of successful ageing

Based upon previous research and findings from study I[24,164], study II used a model of successful ageing comprising of 5 components. The dimensional measures of successful ageing with 5 domains included: (i) Physical health and function; (ii) Mental well-being; (iii) Social functioning; (iv) Psychological well-being; and (v) Spirituality / religiosity.

The raw scores of component measures of *physical health and function (*IADL, chronic illness and self-reported health status), *mental well-being (*CFQ , GDS-15 and self-reported mental health), s*ocial functioning (*level of social/productive/individual activities, and amount of social support/ network from friends and family), *psychological well-being (*CD-RISC, LASA-D and LOT-R), and *spirituality/religiosity* (5 items) were recoded such that higher scores indicated better functioning. The scores were converted to z-scores and

averaged into a single summary measure for each of the 5 components of successful ageing model.

The measurements used to assess each of the 5 dimensions of successful ageing are described below:

3.2.3.3 Dimension of successful ageing model: Assessment of physical health and function component

Variable of physical health and function dimension was assessed by three measures: the Instrumental activities of daily living (IADL)[149] , presence of chronic illnesses and self-reported health status. Functional status was assessed with the IADL, which measured older adults' ability to live independently in the community and included eight items. The items were rated from '1' (completely unable) to '3' (without help, able to do). Summated scores were recoded that that higher scores indicated less dependency on others. Functional independence was defined as not needing any help in one or more IADL tasks Presence of chronic illnesses was assessed through self-report by asking participants to indicate whether they had been diagnosed and treated for any one or more from a list of 20 chronic medical conditions ("yes/no"), including high blood pressure, diabetes, coronary heart disease, cardiac failure, stroke, arthritis, asthma/COPD, cancer, and others. For self-reported health status, an item asked "In general, would you say your health is:", and participants were asked to rate on a 5-point scale (1=poor to 5=excellent). Similar measures of health and functions have been used in previous successful ageing research[2,24].

3.2.3.4 Dimension of successful ageing model: Assessment of mental / cognitive well-being component

Three measures: the Cognitive Failures Questionnaire (CFQ)[165], Geriatric Depression Scale-15 items (GDS-15)[152] and self-reported mental health were used to assess the mental / cognitive well-being variable. Everyday failures in memory, perception, and motor control was assessed using the 20 items from the CFQ questionnaire. Questions included : 'Do you forget appointments?' and 'Do you leave important phone calls, or letters unanswered for days?' Each item was scored on a 5-point scale (1=never to 5=very often). Summated scores ranged from 0 to 80 and were recoded such that higher scores indicate better cognition. Presence of depressive symptoms was assessed using the GDS-15. The total score ranged from 0 (no depressive symptoms) to 15 (severe depressive symptoms, participants with summed scores of 5 and above were considered to have depressive symptoms[152]. Summated scores were recoded such that higher scores indicated less depressive symptoms. For self-reported mental health, participants were asked; "Comparing yourself with people of your own age, would you say your mental health is:", and rate from a scale of 1-5 (1=poor to 5=excellent).

3.2.3.5 Dimension of successful ageing model: Assessment of social engagement component

Social engagement was assessed using two measures: the frequency of engagement in leisure time activities and amount of social support received from others.   Participants were given a list consisting of 54 social, productive, and individual activities, and asked how often they participated in

these activities during the past month on a scale from 1-6 (1=never to 6=everyday). Examples of activities included: reading, volunteering, cooking, visiting family and friends, and engaging in sports activities/exercises such as swimming or walking. Scores from the 54 activities were summated with higher scores indicating greater level of participants in activities. To assess the amount of support participants received from friends and family, 7 items were asked. Items assessed: "how often friends or family members made participants feel loved and cared for; willing to listen when participants need to talk about their worries/problems; willing to help participants with daily tasks such as shopping; give participants advice about medical, financial, or family problems; make too many demands on participants; critical of what participants do; and whether participants feel lonely". Each item was scored on 4-point scale. Scores were summated such that higher scores indicate greater social support received from others.

3.2.3.6 Dimension of successful ageing model: Assessment of psychological well-being component

Psychological well-being variable was assessed by three measures of resilience, mastery and optimism. *Resilience* was measured using the Connor-Davidson Resilience Scale [CD-RISC][166], a 25-item questionnaire with each item scored on a five-point scale (0=not true at all to 4=true nearly all the time). Scores were summated and ranged from 0-100, with higher scores indicating greater resilience. Factor analysis of the scale in older cohorts[101] yielded four factors: 1) personal control and goal orientation, 2) adaptation and tolerance for negative affect, 3) leadership and trust in instincts, and 4) spiritual coping.

The Pearlin Mastery Scale [LASA-D][167] was used to assess the extent of participants' sense of control over life outcomes. There were 7 items and examples include: "I often feel helpless in dealing with the problems of life" and "What happens to me in the future mostly depends on me". Each item was scored on a 4-point scale (1=strongly agree o 4=strongly disagree), and all item scores were summed such that higher scores indicate greater mastery.

The Life Orientation Test-revised [LOT-R][168,169] measuring individual differences in generalized optimism versus pessimism was used. Examples of questions include: "In unclear times, I usually expect the best" and "I rarely count on good things happening to me". Each of the 6 items were scored on a 5-point scale (1=strongly disagree to 5=strongly agree) and summed such that higher scores indicate greater optimism.

3.2.3.7 Dimension of successful ageing model: Assessment of spirituality and religiosity component

Participants were asked 5 questions relating to spiritual/religious activities and beliefs. Items were: "How often do you attend church, synagogue, or other religious meetings?"; "How often do you spend time in private spiritual activities, such as prayer/mediation"; "In my life, I experience the presence of the Divine"; "My spiritual beliefs are what really lie behind my whole approach to life"; and "I try hard to carry my spiritual beliefs over into all other dealings in life". Each item was scored on a 6-point scale (0=never/definitely not true to 5=more than once a week /definitely true). Items were summated such that greater scores (range 0-25) indicate more spiritual/religious engagement.

Quality of life and life satisfaction were also measured and used as outcome measures in this study. The measurements used for these 2 variables are described below.

3.2.3.8 Assessment of quality of life

Quality of life was assessed using the 36-item Short-Form Health Survey (SF-36)[170,171], which is a subjective measure of health-related quality of life. It includes eight health domains: physical functioning, role limitations due to physical problems, bodily pain, general health, vitality, social functioning, role limitations due to emotional problems, and mental health. The 21 items from the physical functioning, role-physical, bodily pain and general health subscales were summated to give a Physical Component Score (PCS). The 14 items from the vitality, social functioning, role-emotional and mental health subscales were summated to give a Mental Component Score (MCS). Summed scores ranged from zero (lowest level of functioning) to 100 (highest possible level of functioning). All scoring was done following instructions from the manuals[170,171]. The SF-36 has been used in numerous studies and has been validated in normative studies in the local population[163].

3.2.3.9 Assessment of life satisfaction

Life satisfaction was assessed using two measurements. The Satisfaction with Life Scale [SWLS][172], which is a validated 5-item scale was used to assess general satisfaction with life. Sample questions include "In most ways my life is close to my ideal" and "The conditions of my life are excellent". Each item was scored on a 7-point scale (1=not at all true to 7=absolutely true), and summated such that higher scores indicating better life satisfaction.

A single-item self-rated scale was used to measure global self-satisfaction. Participants were asked: "How satisfied were you during the following time in your life: Older adulthood (65+ years)", and rate on a 10-point scale (1=Not at all satisfied to 10=very satisfied). Higher score indicate greater satisfaction.

3.2.3.10 Assessment of socio-demographic background

Socio-demographic variables such as age, gender, ethnicity, marital status, living arrangement, educational level and housing type were also collected.

3.2.4 Data analyses

In study II, using the variables illustrated above, the validity and reliability of a self-rated single-item scale of global successful ageing that ranged from one to 10, was examined.

After data screening and checking, data from 489 participants were used for analyses. From the original 500 participants in the SSOSA database, 11 cases were removed (4 with missing data on the self-rated single-item scale of global successful ageing; 1 replicate case; 6 extreme outlier cases removed using casewise diagnostics and scatterplots). Subsequently, data from a separate group of 33 Chinese participants were used to assess the reliability of the self-rated single-item scale of global successful ageing scale.

First, to examine construct validity of the self-rated single-item scale of global successful ageing, ratings on the self-rated single-item scale of global successful ageing were correlated with dimensional models of successful ageing using Pearson's correlations. Subsequently, these associations were further explored in in linear regression models in which each of the

dimensional measures were analyzed individually as predictor variables of self-rated single-item scale of global successful ageing (DV), and in hierarchical models in which the five dimensional measures were added in sequence to evaluate the change in model R-squared values. The five specific dimensional models refer to components associated with successful ageing: physical well-being (IADL, chronic illness and self-reported health status); mental well-being (CFQ, GDS-15 and self-reported mental health); social well-functioning (level of social/productive/individual activities, and amount of social support/ network from friends and family), psychological well-functioning (CD-RISC, LASA-D and LOT-R) and spiritual wellbeing.

Next, the criterion validity of the self-rated single-item scale of global successful ageing was evaluated by examining it as an independent variable in linear regression analyses predicting two outcome indicators, life satisfaction and quality of life. The outcome indicators included two measures of life satisfaction: the single item of global life satisfaction and the SWLS; and the SF-36 PCS and MCS measures of quality of life. Its model R-squared value was compared with those of separate models of dimensional measures of SA predicting life satisfaction and quality of life measures.

Thirdly, forward stepwise multiple regression analyses was performed to identify significant independent correlates of global and dimensional measures of SA, using $p<0.20$ for inclusion and $p<0.05$ for retention in the model.

Finally, reliability of the self-rated single-item scale of global successful ageing was examined by using test-retest correlations.

All analyses were carried out with SPSS statistical software 18.0 (SPSS, Inc, Chicago, Illinois) and the level for statistical significance was set at 0.05.

3.3 METHOD: Study III

In study III, gender and ethnic differences in variables associated with successful ageing (ageing perceptions, mortality salience and spirituality; health status; life satisfaction; and influential factors) and subjective ratings on the self-rated single-item scale of global successful ageing was examined. Similar to study II, study III used cross-sectional data taken from the Singapore Study of Successful Ageing (SSOSA) research project [Note: study II also used data from the SSOSA project].

With permission from Professor Dilip Jeste, the questionnaire used in the SSOSA project was the Stein Research Institute for Successful Ageing Questionnaire, which was developed at the University of California, San Diego[29,28].

3.3.1 Research design; population and sample

The study design, sampling design, inclusion/exclusion criteria and sample size calculation were previously illustrated under study II [Note: please refer to sections 3.2.1 and 3.2.2 for details].

3.3.2 Measurements

The measurements used for Study III were obtained from the Stein Research Institute for Successful Ageing Questionnaire[29,28] which was adapted for local use **[Appendix 3]**. Please refer to section 3.2.3 for more details.

The variables and measurements from the Stein Research Institute for Successful Ageing questionnaire used for data analyses in study III are illustrated below.

3.3.2.1 Assessment of self-rated global successful aging

Self-rated global successful ageing was assessed using the self-rated single-item scale of global successful ageing, which was examined in Study II (**Figure 2**). Participants were asked to rate their own level of successful ageing on an analogue scale from one to 10 (1=least successful to 10=most successful). The statement ask: Where do you rate yourself in terms of "successful aging?"[29,28].

3.3.2.2 Assessment of ageing perceptions

The variable of ageing perceptions was assessed by the following five measurements. *Perception of age relative to known chronological age.* Participants were asked to state their chronological age ("How old are you" and was later cross-checked with their data of birth). Participants were also asked: "How old/young do you feel". Subsequently, to determine whether participants feel younger or older than their chronological age, the differences between chronological age and psychological age was calculated. *Prospects of ageing and perceived uselessness.* Participants were asked whether they agree or disagree with 2 statements: "Things keep getting worse as I get older" and "As I get older, I am less useful". These two items were taken from the Attitude toward Own Aging scale[173,174], which measure the older person's perception of the change taking place due to the aging process they experience. *Perceived ageism.* Participants were asked whether they agree or

disagree with this statement: "Within the past 30 days, have you felt emotionally upset as a result of how you were treated based on your age? Agreement with this statement indicated that participants felt discriminated by their age. *Quality of life versus living longer.* Two statements were given and participants were asked to choose the one that is true for them. The statements are "I want to live as long as possible regardless of the quality of life I experience" and "I want to preserve a good quality of life even if this means that I may not live as long". Preference to have quality of life over longevity would refer to the second statement while preference to have longevity over quality of life would be indicated by choosing the first statement.

3.3.2.3 Assessment of mortality salience and religiosity / spirituality

Mortality salience and religiosity / spirituality variable were measured through questions that asked about their views about death and religiosity / spirituality. *Views about death.* Participants were asked to rate their views regarding mortality with 2 questions measured on a Likert scale of 1-10 (1=never / Not at all to 10=All the time / Very much]. The items are: "To what extent you think about death" and "To what extent you fear of death". Higher scores indicate increased thoughts about death. *Religiosity/spirituality.* Participants were asked 5 questions relating to religious/spiritual activities and beliefs. They were "How often do you attend church, synagogue, or other religious meetings?"; "How often do you spend time in private spiritual activities, such as prayer or mediation"; "In my life, I experience the presence of the Divine"; "My spiritual beliefs are what really lie behind my whole approach to life"; and "I try hard to carry my spiritual beliefs over into all other dealings in life". Each item was scored on a 6-point scales (0=never/definitely not true to

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5=more than once a week /definitely true). Scores from items were summated and greater scores (range 0-25) indicate more spiritual/religious engagement.

3.3.2.4 Assessment of self-reported health status

The variable of overall health status was assessed with four different measurements. *Chronic illness*. Occurrence of illness was assessed through self-report by asking participants to indicate whether they had been diagnosed and treated for a list of 20 and other chronic medical conditions ("yes/no"), including diabetes, high blood pressure, heart attack, stroke, osteoporosis, cirrhosis of the liver, rheumatoid arthritis, traumatic brain injury, cataracts, dementia, Parkinson's disease, COPD, emphysema, cancer and others. *Self-reported general health.* Participants were asked: "In general, would you say your health is:", and rate on a 5-point scale (1=poor to 5=excellent). *Self-reported mental health*. Participants were asked to rate their own mental health on a scale from 1-5 (1=poor to 5=excellent) using the question: "Comparing yourself with people of your own age, would you say your mental health is". *Physical functioning.* Four questions from the physical functioning domain of the 36-item Short-Form Health Survey (SF-36)[170,171], a subjective measure of health-related quality of life were used. All four items were based on 3-point scale (1=Yes, limited a lot to 3=No, not limited at all). Participants were asked whether their health limit them in these four activities: "Moderate activities (i.e., moving a table, pushing vacuum cleaner, bowling, playing golf); lifting or carrying groceries; climbing one flight of stair; and bathing or dressing yourself". Ratings for the four items were summated with higher scores indicating better physical functioning.

3.3.2.5 Assessment on life satisfaction

Life satisfaction was assessed with three measurements. *Overall satisfaction with life* was measured with the Satisfaction with Life Scale [SWLS][172]. It is a validated 5-item scale to assess general satisfaction with life. Sample questions include "In most ways my life is close to my ideal" and "The conditions of my life are excellent". Each item was scored on a 7-point scale (1=not at all true to 7=absolutely true), and summated such that higher scores indicating better life satisfaction. *Satisfaction regarding relationships with others.* Participants were asked to rate their satisfaction regarding their relationships with friends and relatives on a 10-point scale [1=not at all satisfied to 10=very satisfied]. Question asked was "In general, how satisfied are you with your relationship with friends and relatives". Higher scores indicate greater satisfaction. *Satisfaction with finances.* Participants were asked to rate their satisfaction with their finances on a 10-point scale [1=not at all satisfied to 10=very satisfied]. Question asked was "In general, how satisfied are you with your finances". Higher scores indicate greater satisfaction.

3.3.2.6 Assessment of views on important successful ageing factors

A list of 11 factors known to contribute to successful ageing were given and participants were asked to choose five factors they believe have been most influential to their own successful ageing ("yes/no"). Participants were also asked to choose the top most important factor from the list. Factors include: good genes, physical exercise, adapting well to change, financial stability,

physical health, work satisfaction, healthy diet, positive outlook, mental activities, close friends/family and fulfilling marital/significant relationships.

3.3.2.7 Assessment of socio-demographic background

Socio-demographic variables such as age, gender, ethnicity, marital status, living arrangement, educational level and housing type were also collected.

3.3.3 Data analyses

In study III, gender and ethnic differences on variables associated with successful ageing (ageing perceptions, mortality salience and spirituality; health status; life satisfaction; and influential factors) and self-rated successful ageing using the self-rated single-item scale of global successful ageing was examined.

After data cleaning and checking was conducted, cross-sectional data from 495 participants were used for analyses. From the original 500 participants from the SSOSA database, five cases were removed (4 with missing data on the self-rated single-item scale of global successful ageing; 1 replicate case).

First, Pearson chi-square tests of significance and analysis of variance (ANOVA) were used to examine gender and ethnic differences on subjective ratings on the self-rated single-item scale of global successful ageing, and variables associated with successful ageing (ageing perceptions, mortality salience and spirituality; health status; life satisfaction). In addition, gender and ethnic differences on ranking of important influential factors on successful ageing were also examined. Subsequently, to adjust for covariates, these variables were analysed with either logistic (dichotomous dv) or linear

(continuous dv) regression model with gender as the independent variable. In examining gender-based differences, covariates of ethnicity and age were controlled for. However, covariates of gender and age were not adjusted for ethnic-based differences due to the small proportion of Malay and Indian participants.

Finally, stepwise multiple regression analyses were used to identify significant independent predictors of self-rated successful ageing in whole sample, males, females, Chinese and Malays/Indians (Indian participants were omitted due their small sample size), using $p<0.20$ for inclusion and $p<0.05$ for retention in the model.

All analyses were carried out with SPSS statistical software 18.0 (SPSS, Inc, Chicago, Illinois) and the level for statistical significance was set at 0.05.

3.4 METHOD: Study IV

In study IV, the purpose was to further explore and understand the perceptions of successful ageing for Singaporean Chinese, Malay and Indian using focus group discussions.

3.4.1 Research design

A qualitative approach using focus group method was used in Study IV. The aim was to garner insights on the meaning of successful ageing by asking participants to collectively explore, discuss and construct meaning to the research question of what successful ageing means to them[175,176].

I played the role of a research assistant in this focus group project [principal investigator: A/Prof Ng Tze Pin]. I was involved in: planning the project

design; formulating and developing questions and protocol guide; recruitment of participants; was the main moderator present in all focus group sessions; transcribed audio-taped files of the discussions; involved in the coding, analysis and interpretation of the data. This project was guided by Dr Jonathan Marshall, who had experience in qualitative research.

Ethical approval was given by the National University of Singapore Institutional Review Board (see **Appendix 8**).

3.4.2 Population and sample

The participants were Singaporean Chinese, Malay or Indian seniors aged 65 and over. Eligible participants were Singaporean citizens or permanent residents aged 65 and above, living in the community, able to give informed consent and able to converse in English or Mandarin. [Due to the linguistic skills of the moderator, Malay and Indian participants were required to have basic English conversational skills while Chinese participants has to choice of speaking in English or Mandarin.]

To recruit participants, purposive and snowball sampling methods were used. First, an internet search was conducted such that community, social and recreational service organizations for the elderly such as senior activities centers and community groups were contacted. Contacted organizations were then asked on whether they were able to refer seniors who may be interested in participating in the project. Overall, six organizations referred interested participants to this project (Care Corner Seniors Activity Center, Toa Payoh; Centre For Seniors; Council for 3rd Age; Sultan Mosque; Sara Senior Activity Center, Presbyterian Community Services; and Singapore Action Group of

Elders, SAGE). In addition, participants were also recruited through referrals from enrolled participants and from the existing database available in the research group. After screening for eligibility, all interested participants, with schedules permitting, were recruited into a focus group.

It was initially planned that recruitment would stop when data saturation is encountered such that more focus group sessions would not contribute any new information. However, due to time limitation and difficulties in recruiting participants, eight focus groups were conducted with a total of 46 participants. Focus groups were separated according to ethnicity so as to identify potentially ethnic differences. In total, 4 focus group sessions were conducted with Chinese participants and 2 focus group sessions were conducted with Malay and Indian participants respectively (there were difficulties in recruiting older English-speaking Malay and Indian participants).

3.4.3 Measurements

A brief demographic questionnaire asking about age, gender, marital status, living arrangement, monthly income and religion affiliation was developed for the focus group research (study 4) **[Appendix 4]**.

3.4.4 Data collection procedure

The size of each focus group ranged from 4 to 8 participants. A semi-structured focus group design was used based on information provided by other researchers previously [177,175,176]. A semi-structured design was chosen because it allows minimal structure and the use of broad open-ended question

(e.g., question one) enabled participants to discuss their opinions more freely. Such design allows the collection of comparable data from all focus groups[25].

A protocol **[Appendix 5]** was developed to guide all focus group sessions and was planned to last no more than 90 minutes to avoid fatigue. The entire session was divided into four main parts: (1) Pre-introduction; (2) Introduction; (3) Begin topic discussion [discuss question one for 60mins and 30mins for questions two and three]; (4) Conclusion: closing of session and debriefing for moderators. Three primary questions were formulated and asked: (Question 1) What do you think are the important things that contribute to ageing well; (Question 2) You have mentioned many factors contributing to ageing well, let's rank them in order for the top 3 most important ones; (Question 3) Are there any points that were not mentioned but you think are important?

Each focus group started off with the main question (question one: what do you think are the important things that contribute to ageing well), which was intentionally formulated as a broad open-ended question. Hence, participants had the opportunity to express and discuss personal attitudes and beliefs. Depending on the response, a list of broad questions in the protocol guide was available to be used as probes by the moderator in facilitating the discussion **[Appendix 5]**. Terms such as "what makes you happy now"; "what enables you to have a high quality of life"; and "what do you think is necessary for you to age well" were used to describe the term "successful ageing" during discussions.

The interview questions and probes were formulated based on literature review and discussions among the research team. After the protocol and interview guide was drafted, a pilot study was conducted with a group of four participants. Based on the feedback and discussions from the pilot study, the protocol and interview guide questions were finalized. The term "ageing well" was used in replacement of "successful ageing" because feedback indicated that "ageing well" was easier to understand.

A summary flowchart of the structure of the focus group procedure can be seen in **Figure 3**.

To avoid distractions and optimize comfort level, focus group sessions were held in an enclosed quiet room (the location was decided depending on availability and preference of participants). Drinks and snacks were provided before and after the discussions. Upon arrival at the designated research site, participants received the following set of materials: (a) general information about the study; (b) the demographic questionnaire (c) consent form. Participants were encouraged to read through these information and asked questions. With the arrival of all respondents participating in the focus group session, introduction and explanation of the research including purpose, objectives and aims were provided by the moderator. This ensured that all participants understood the purpose of the focus group and were able to express their opinions and views during the discussion. Participants were also requested to switch off their mobile phones and to speak one at a time. All participants provided written informed consent before official commencement of discussion.

During the main discussion, the moderator asked the first primary question. Based on the responses, broader questions and prompts were used to encourage participants to express or elaborate their opinions. To facilitate meaningful discussion, the moderator incorporated non-reflective listening (nodding head and saying "mm-hmm") and reflective listening (seeks to clarify the accuracy of what is being said) by recommended by Fern[177]. Non-reflective listening is a non-verbal acknowledgement to the participants, and helps shy participants to talk and for longer while setting the tone of an empathetic moderating style to the focus group[177]. Reflective listening reduces communication problems by clarifying, paraphrasing, reflecting and summarizing, thus increased the accuracy of what is being said by the participants[177].

Throughout the discussion, the moderator wrote down key-word notes of what participants said. When the main discussion approached saturation point whereby nothing novel was being added, these key points were summarized back to the participants on a large board or paper (Questions 2 and 3 were asked). This ensures the accuracy of the data and consensus of the findings (also a form of data validation). Participants were also encouraged to provide additional information or clarify doubts. This validates the accuracy of the data. Finally, the moderator thanked participants for their time and effort. All participants received S$20 shopping vouchers. Before leaving, participants had to fill in a brief demographic questionnaire.

Including me, four moderators (Dr Jonathan Marshall, two other research assistants) were involved and all received training (from Dr Jonathan Marshall) prior to actual facilitation of discussions. For consistency, I was

present for all 8 focus groups and a maximum of 2 moderators were allowed for each session. All focus group sessions were audio-taped and subsequently transcribed. Focus group discussions conducted in Mandarin were transcribed and translated into English language.

3.4.5 Data analyses

Eight focus groups were conducted with a total of 46 participants (four groups of Chinese and 2 groups of Malay and Indian participants respectively).

First, descriptive statistics were generated on various demographic variables based on information collected from the brief questionnaire. Next, transcripts were analyzed thematically[178] using coding, categorization, constant comparison[179], in the following steps.

(1) Three transcripts were randomly chosen to be independently coded by 3 people, including me (Dr Jonathan Marshall and a research assistant who was not involved in this project). Transcripts were printed out and read line by line. Coded segments were highlighted and assigned codes. In some instances, the same text segment may be assigned by more than one code. From the codes, each coder developed a list of emergent factors.

(2) Next, the lists of emergent factors were reviewed and revised into a single, finalized list by the three coders (field notes written by moderators during focus group discussions were also consulted). Through discussions among the three members, disagreements and inconsistencies of codes and coding segments were resolved. The final list of codes, constructed through consensus, consisted of a number of

factors associated with ageing well. Under each factor, there were numerous related codes, which were obtained from the transcripts.

(3) Using the finalized list of factors and codes, I coded all the transcripts. During coding process, any problems occurred were discussed with the principal investigator and Dr Jonathan Marshall. A total of 693 sentences were coded.

(4) Subsequent data reduction, summarization and interpretation were done by me and were cross-checked (principal investigator and Dr Jonathan Marshall). Coded sentences were grouped according to factors and ethnicity. Codes assigned to factors were recorded and duplicated were removed. Factors and codes were illustrated with quotes from the transcripts. Finally, through comparison, related factors were further condensed into broad themes.

Throughout the data collection and analyses process, methodological rigor was maintained by using the four strategies of credibility, transferability, dependability and confirmability[180,181]. Credibility of findings was increased by discussing and debating findings with members not directly involved in data collection and analyses (e.g., principal investigator). Independent coding by different members (triangulation) also contributed to the credibility of the data. Credibility of findings was further ensured by summarizing discussions back to participants at the end of each focus group session and debriefing sessions among moderators as well. Although findings from this study should not be generalized to other contexts, this project tried to address the issue of transferability by trying to recruit participants from various backgrounds as well as collecting and providing more demographic information about the

participants. The criterion of dependability was addressed by using stepwise

replicability strategy[180]. The same transcripts were coded by different

people and results were compared. There were also frequent communications

and cross-checking between members involved in this project. Detailed

transcripts from audio-recoded discussions and written field-notes were

available for analyses, thus further enhancing dependability. The development

of the code list allows the identification, organization and analysis of data in

an orderly consistent manner. Confirmability was established by

summarizing key-points of discussion back to the participants after each focus

group session. This ensures the accuracy of the data and consensus of the

findings. Debriefing among moderators after each session and frequent

communications between research members also contributed to the neutrality

of the findings.
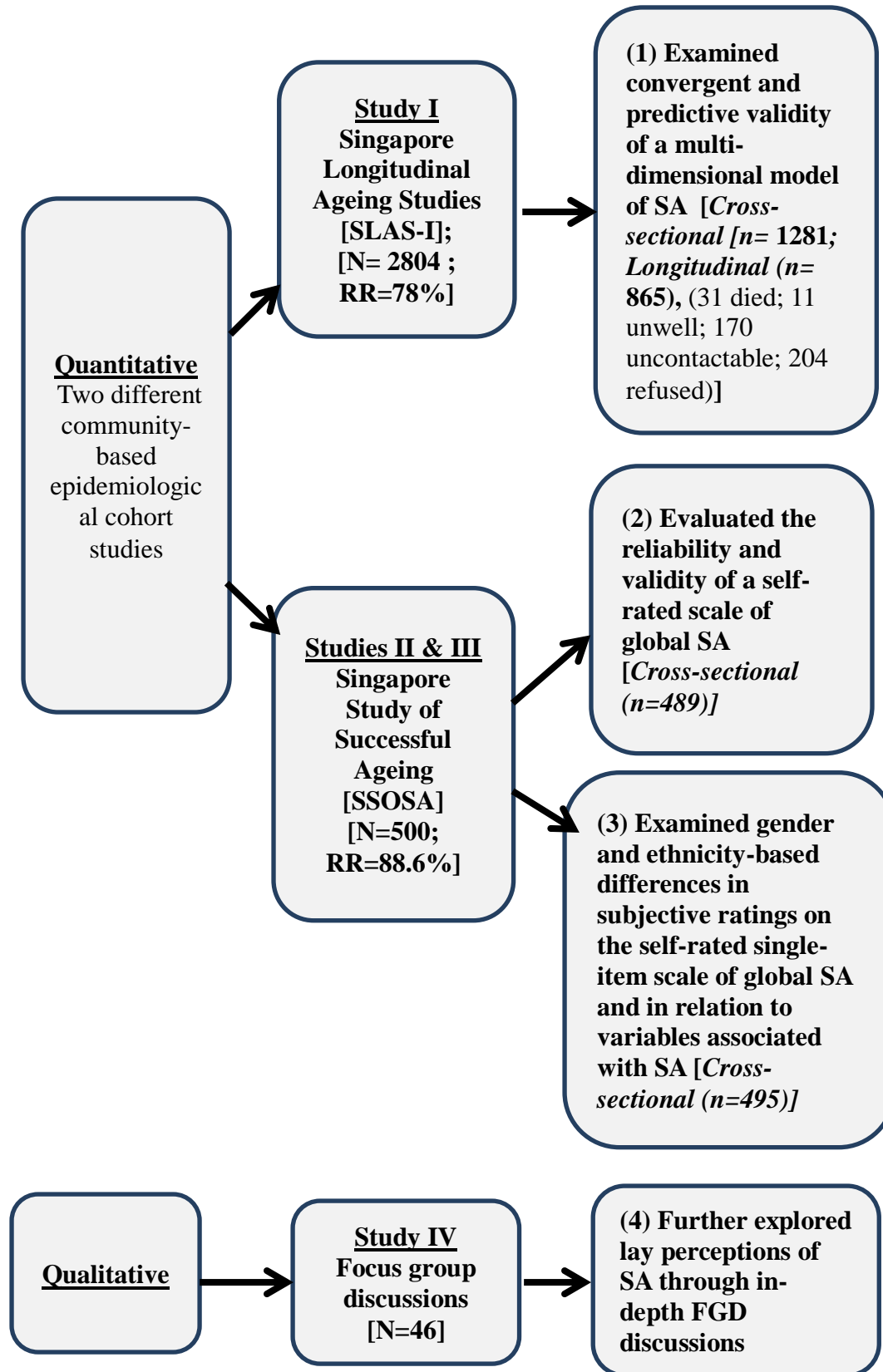
Figure 1. Diagram depicting overall summary of the research design of this thesis

Where do you rate yourself in terms of "successful aging?" *(Please <u>circle one</u> number)*

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

Least successful   Most successful
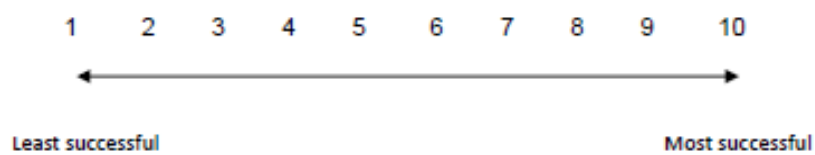
Figure 2. The self-rated single-item scale of global successful ageing (source: Stein Research Institute for Successful Ageing Questionnaire[29,28])

Pre-introduction :

Welcome, provide general information; distribute consent form and demographic questionnaire, provide refreshments.

Introduction (arrival of all participants):

Formal introduction & explanation of FGD; Obtained informed consent

Begin main topic discussion (60mins):

(Qn 1) What do you think are the important things that contribute to ageing well? (Probe questions from the guide were used depending on discussions)

Summarizing main points discussed previously (30mins):

(Qn 2) Rank the top 3 factors; (Qn 3) Are there any missing points that are important?

Conclusion:

Give thanks, refreshments, collect demographic questionnaire and give out reimbursement

Debriefing for moderators:

Dicuss and review notes written from FGD; Write summary report

Figure 3. Flowchart of structure of focus group discussions

CHAPTER 4

RESULTS & DISCUSSION: STUDY I

This chapter reports findings from study 1. The aim was to evaluate the validity of a broad multidimensional model of successful ageing in Singaporean Chinese seniors aged 65 and above. Predictors of successful ageing were also examined. The broad multi-dimensional construct of successful ageing examined is made up of four dimensions: physical health and well-functioning; cognitive and emotional well-functioning; high social functioning and active life engagement; and high life satisfaction.

4.1 Results

Demographics

From 2804 participants, cross-sectional data from 1281 participants aged 65 and above were used for analyses (response rate of 78%). The mean age of respondents was mean age of 72.1 years (SD= 5.8); 60% (n=769) were women and 67% (n=858) had primary education or below. Among them, 61.2% (n=784) were found to be cognitively and emotionally well-functioning; 47.9% (n=614) were reportedly physically healthy and independent; 78.4% (n=1004) reported high social functioning, and 88.2% (n=1130) reported positive life satisfaction.

For longitudinal analyses, out of the 1281 participants, data from 865 participants were used [31 died; 11 unwell; 170 uncontactable; 204 refused]. Independent t-tests were conducted to compare baseline ratings and I found that compared to those who did not participate in the follow-up interviews,

participants with follow-up data showed better baseline ratings on IADL performance, GDS scores, MMSE scores, SF-12 MCS and PCS scores. There was significant differences in baseline IADL scores for those who followed up (M=.43, SD=1.13) and those who did not (M=.73, SD=1.62); t (1280) =32.4, $p<0.001$. There was significant differences in baseline GDS scores for those who followed up (M=1.76, SD=2.59) and those who did not (M=2.13, SD=2.98); t (1280) =11.4, $p<.05$. There was significant differences in baseline MMSE scores for those who followed up (M=27.1, SD=3.22) and those who did not (M=26.4, SD=4.26); t (1280) =24.4, $p<0.001$. There was significant differences in baseline SF-12 MCS scores for those who followed up (M=54.2, SD=7.24) and those who did not (M=52.8, SD=7.90); t (1280) =17.3, $p=0.002$. There was significant differences in baseline SF-12 PCS scores for those who followed up (M=.43, SD=1.13) and those who did not (M=.73, SD=1.62); t (1280) =4.57, $p=0.02$.

Successful ageing and non-successful ageing status

The four dimensions criteria for successful ageing are presented in **Table 1**. A summary composite measure was created across all dimensions to form a dichotomous variable. To be categorized as successful agers, participants should meet the criteria for successful ageing on all four dimensions.   Overall, 28.6% (*n*=366) met the multidimensional criteria for successful aging and majority of participants (*n*=915) were classified as non-successful ageing.

Cross-sectional: Correlated and independent factors of successful ageing

To examine whether successful ageing would be correlated concurrently with specific demographic, psychosocial and behavioural factors; independent t-tests and chi-square tests were conducted with successful ageing (n=366) or not (n=915) as the dependent variable (**Table 2**). Inspection of the results indicates that out of 21 factors, several factors were significantly correlated with successful ageing.

As compared to the non-successful ageing participants, successfully aging seniors more frequently reported being younger, $t(1279)=9.20$, $p<.001$, received higher level of education, $X^2(1, N=1279)=76.5$, $p<.001$, more likely to live in better housing, $X^2(1, N=1279)=32.0$, $p<.001$, being currently married, $X^2(1, N=1279)=4.6$, $p<.001$, having someone to confide in $X^2(1, N=1279)=15.5$, $p<.001$, having regular phone calls with others, $X^2(1, N=1279)=9.5$, $p<.01$, having someone to help when needed, $X^2(1, N=1279)=18.7$, $p<.001$, having better social network and support, $X^2(1, N=1279)=10.4$, $p<.01$, more likely to report religious and/or spiritual beliefs, $X^2(1, N=1279)=16.5$, $p<.001$, having regular physical activities or exercise, $X^2(1, N=1279)=27.3$, $p<.001$, and little or no nutritional risk, $X^2(1, N=1279)=34.3$, $p<.001$.

Subsequently, logistic regressions were performed to identify independent factors of successful ageing (Table 2). All demographic, psychosocial and behavioural variables entered into the models but for clarity, only significant independent correlates were shown. Analyses revealed seven significant independent determinants of successful aging: younger age (*OR*=0.90, 95% *CI*= 0.88-0.93, *p*<.001), female gender (*OR*=1.37, 95% *CI*=

1.02-1.85, *p*<.01), higher-end housing (*OR*=1.41, 95% *CI*= 1.03-1.93, *p*<.01), better education (*OR*=2.31, 95% *CI*= 1.71-3.10, *p*<.001), physical activities and exercise (*OR*=1.90, 95% *CI*= 1.35-2.68, *p*<.001), having religious and/or spiritual beliefs as a source of support/comfort (*OR*=1.64, 95% *CI*= 1.22-2.22, *p*<.001), and low or no nutritional risk (*OR*=2.16, 95% *CI*= 1.60-2.92, *p*<.001).

Cross-sectional: Association of variables representing physical and functional substrates of wellbeing with successful ageing status [convergent validity]

Independent t-tests and chi-squares tests showed significant differences in health status and healthcare use between successful and non-successful aging seniors *(***Table 3***)*. Overall, successful aging respondents reported significantly fewer chronic medical problems and medical illnesses, X^2(1, *N*=1281)=23.5, *p*<.001, and had better POMA scores of mobility, *t*(1268)=8.1, *p*<.001. They showed similar proportions of overweight and obesity, more normal weight and fewer underweight, X^2(2, *N*=1281) =6.30, *p*=.004. Visual impairment was less frequent in successful aging respondents, X^2(1, *N*=1281) =29.0, *p*<.001, but there were no significant differences in hearing impairment, X^2(1, *N*=1281) =0.6, *p*=.42). Successful aging seniors reported fewer physician visits, *t*(1279)=3.5, *p*<.001, less multiple (≥5) prescription drugs use, X^2(1, *N*=1281)=27.0, *p*<.001, and more alternative medicine, X^2(1, *N*=1281)=8.30, *p*<.01 or vitamins use, X^2(1, *N*=1281)=6.0, *p*=.02.

Cross-sectional and Longitudinal: Association of successful ageing with

quality of life measured at baseline and two years later [Predictive validity]

Predictive validity of the multidimensional model of successful ageing was examined by comparing baseline successful ageing status with quality of life measured both at baseline and two years later. In this group of followed up participants, baseline successful aging status was found to be significantly associated with better scores of the SF-12 quality of life at baseline: PCS-SF12, $F(1, 1274)=70.8$, $p=<.001$ and MCS-SF12, $F(1, 1274)=28.5$, $p=<.001$; and at 2 years: PCS-SF12, $F(1, 865)=5.8$, $p=<.05$ and MCS-SF12, $F(1, 865)=7.9$, $p=<.001$ in both cross-sectional and longitudinal analyses *(**Table 4***).

Table 1. Prevalence of Successful Aging in Chinese elderly aged 65+

	Prevalence (*n*)
Total sample size at baseline	1,281
1. **Physical health and well-functioning, %**	47.9 (614)
Good or excellent self-reported health status *and*	64.6 (827)
Independent in instrumental ADL	67.1 (860)
2. **Cognitive and emotional well-functioning, %**	61.2 (784)
MMSE ≥26 *and*	68.1 (872)
GDS <5	87.0 (1114)
3. High **social functioning and active life engagement, %**	78.4 (1004)
Engaged in at least one social activities *and*	82.8 (1061)
Engaged in at least one productive activities	90.7 (1162)
4**. High life satisfaction (score <11), %**	88.2 (1130)
Successful aging[#]	28.6 (366)

Combined criteria (1 and 2 and 3 and 4): Participants categorised as successful ageing if they fulfilled criteria from all four dimensions.

Physical health and well-functioning: Self-reported health status using 4-point scale (excellent, good, fair, poor); IADL (not needing any help on all 8 tasks).

Cognitive and emotional well-functioning: MMSE (30 items, total score of 30); GDS (15 items, total scores ranged from 0-15; scores of ≥ 5considered to have depressive symptoms).

Social functioning and active engagement: Level of participation (often or at least once a week) from a list of 16 social or productive activities.

Life satisfaction: Self-reported Life Satisfaction Scale (4 items on 5-point scale), total summed scores ranges from 4-18; scores <11 indicated positive life satisfaction.

Table 2. Associations of sociodemographic, psychosocial and behavioral determinants of successful aging in Chinese elderly aged 65 years or older

	Non-successful aging	Successful aging	Chi-squared test	dF	p value	Multivariate analysis			
						Adjusted OR (95% C.I.)	Wald test	dF	p value
Total sample size	915	366							
Age, yr, mean (SD)	72.9 (6.1)	69.7 (4.2)	9.2	1279	<0.001	0.90 (0.88-0.93)	45.8	1	<0.001
Female	59.2	62.3	1.0	1	0.31	1.37 (1.02-1.85)	4.4	1	0.04
More than 6 years of education	26.1	51.6	76.5	1	<0.001	2.31 (1.71-3.10)	29.9	1	<0.001
Housing type: larger (>3 rooms) public/ private housing	59.5	76.2	32.0	1	<0.001	1.41 (1.03-1.93)	4.6	1	0.03
Social network and support									
Being married (vs. single, divorced, widowed)	65.6	71.9	4.6	1	0.032				
Living with others (vs. living alone)	91.1	92.1	0.3	1	0.56				
Having someone to confide with	92.2	98.1	15.5	1	<0.001				
Frequent visits by children/ relatives/ friends	73.6	77.2	1.8	1	0.18				
Having regular phone calls by children/ relatives/ friends	78.7	86.2	9.5	1	0.002				
Having someone to help when needed	88.3	96.2	18.7	1	<0.001				
Having 3 or more of the factors above	87.5	93.7	10.4	1	0.001				
'No or little' financial difficulty in paying medical bills	49.0	53.2	1.8	1	0.18				
Religious/spiritual beliefs source of support/comfort to great extent	21.6	32.5	16.5	1	<0.001	1.64 (1.22-2.22)	10.4	1	0.001
Non or ex-smokers (vs. current smokers)	92.0	94.5	2.5	1	0.12				
Alcoholic drink daily	6.3	9.0	2.8	1	0.09				
Watch what I eat (often or sometimes)	64.8	68.0	1.2	1	0.28				
Physical activities and exercise (often or sometimes)	69.7	83.9	27.3	1	<0.001	1.90 (1.35-2.68)	13.4	1	<0.001
Good sleep (often or sometimes)	71.9	75.4	1.6	1	0.20				
Time for leisure (often or sometimes)	60.6	60.7	0.01	1	0.99				
No or low nutritional risk (NSI score <3)	59.7	77.0	34.3	1	<0.001	2.16 (1.60-2.92)	25.3	1	<0.001

Notes: Values are in & unless otherwise stated. Independent t-test for mean and chi-square tests for proportion. The full model for logistic regressions includes all other variables shown but for clarity, only significant independent correlates of successful ageing were presented in this table.

Table 3. Physical health status and healthcare use correlates of successful aging in Chinese elderly aged 65 years or older

	Non-successful aging (*n*=915)	Successful aging (*n*=366)	Test statistic	dF	P value
Self-reported chronic medical conditions/ illnesses					
Hypertension	67.2	57.4	11.0	1	0.001
Dyslipidemia	59.8	59.3	0.03	1	0.87
Diabetes	24.0	12.3	22.0	1	<0.001
Stroke	6.0	1.1	14.4	1	<0.001
Cardiac diseases:	13.9	6.0	15.7	1	<0.001
Ischemic heart disease/ IHD	8.9	4.6	6.6	1	0.01
Atrial fibrillation	1.6	0.3	4.0	1	0.05
Heart failure	6.9	2.2	11.0	1	0.001
Major eye disorders (cataract, glaucoma, etc)	48.7	42.9	3.6	1	0.06
Musculoskeletal/ motor disorders[a]	22.1	18.9	1.6	1	0.20
Gastric problems	3.1	2.2	0.7	1	0.39
Respiratory problems[b]	38.4	27.3	14.0	1	<0.001
Number of medical conditions/ illnesses: None	5.5	7.9			
One or two	36.7	49.2	23.5	2	<0.001
Three or more	57.8	42.9			
Body Mass Index (kg/m^2): Underweight (<18.5)	7.8	4.1			
Healthy range (18.5-22.9)	38.3	42.5	6.3	2	0.04
Overweight and obese (≥23)	53.9	53.4			
POMA[c] score, mean (SD)	30.8 (5.0)	33.0 (2.1)	8.1	1268	<0.001
Hearing problem	3.9	3.0	0.6	1	0.42
Visual impairment[d]	34.6	19.2	29.0	1	<0.001
Hospitalization (>=1) in past year	5.5	3.0	3.6	1	0.06
Number of physician visits in past year, mean (SD)	5.0 (6.2)	3.8 (5.2)	3.5	1279	0.001
Use of multiple (≥5) prescription drugs	19.5	7.7	27.0	1	<0.001
Use complementary/ alternative medicine	36.0	44.8	8.3	1	0.004
Use vitamin supplements	36.6	44.0	6.0	1	0.02

Note: Values are in % unless otherwise stated; Independent t-test for mean and chi-square test for proportion

aArthritis, knee or back pain, hip fracture, osteoporosis.

[b]Asthma, COPD, Chronic bronchitis (cough up with phlegm on most days for 3 consecutive months in past yr), spirometric-based FEV1/FVC<.07).

[c]Performance-oriented mobility assessment for balance and gait; maximum possible score=35, higher score denoting better function.

[d] Visual impairment: very low visual acuity of log MAR>0.6 (Snellen 20/80)

Table 4. Associations of successful aging with quality of life in Chinese elderly aged 65+ (cross-sectional and longitudinal analyses)

	Adjusted mean (SE)		Test statistic	dF	P value
	Non-successful aging	**Successful aging**			
Cross-sectional analysis (N=1,281)					
Physical wellbeing score (PCS-SF12)	46.8 (0.35)	50.8 (0.44)	70.8	1,1274	<0.001
Mental wellbeing score (MCS-SF12)	53.3 (0.40)	56.1 (0.50)	28.5	1,1274	<0.001
Longitudinal analysis (N=865)					
Physical wellbeing score (PCS-SF12)	48.8 (0.37)	50.0 (0.46)	5.8	1,833	0.02
Mental wellbeing score (MCS-SF12)	56.1 (0.38)	57.6 (0.47)	7.9	1,833	0.005

Test: ANOVA; Higher scores denote better quality of life

Models were adjusted for age, education, gender, medical comorbidities; and for the longitudinal models were adjusted for length of follow-up, and their respective baseline score

Test statistic was quoted from the adjusted models

PCS-SF12: Physical component summary score [Medical Outcomes Study 12-item Short Form], scores ranged from 0-100; higher scores indicate better health status

MCS-SF12: Mental component summary score [Medical Outcomes Study 12-item Short Form], scores ranged from 0-100; higher scores indicate better health status

4.2 Discussion

The aim of study I was to examine the validity of a broad multidimensional model of successful ageing composed of 4 dimensions: physical health and well-functioning; cognitive and emotional well-functioning; high social functioning and active life engagement; and high life satisfaction.

Data from this study supported the construct and predictive validity of a proposed multidimensional model and operational construct of successful aging in Chinese seniors. It demonstrated good convergent validity with concurrent health status and healthcare use parameters, and predicted subsequent levels of quality of life. By virtue of its broad multidimensional construct, successful aging was shown to be associated with a multiplicity of demographic, environmental, psychosocial and behavioural determinants, notably more in numbers and strength of association than those shown in studies that used restricted biomedical and physical functional definitions of successful aging.

Studies using a biomedical model of successful aging generally reported a lack of association with gender, income, education and marital status[24]. Our results are in good concordance with two studies of Chinese elderly in Hong Kong and Shanghai[182,143] which also used multidimensional criteria including cognitive functioning, affective status and productive involvement. Both studies identified the factors most related to successful aging to be socio-demographic like younger age, male gender, education, currently married, financial well-being and leisure activities. Also, recent focus group studies of older adults[25] have shown that older adults place less emphasis on factors

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such as longevity, genetics, absence of disease or disability, function and independence, but more emphasis on psychosocial factors as keys to successful aging. A significant observation was that positive attitude and adaptation strategies often compensated for impaired physical health, and furthermore active social engagement required a foundation of security and stability[25].

In this study, age, gender, higher-end housing, better education, physical activities and exercises, better social networks, religious and/or spiritual beliefs as a source of support/comfort and nutrition were salient factors associated with successful ageing. The importance of spirituality was particularly worth noting, given that religious and/or spiritual beliefs play positive roles in mental and psychosocial well-being[110], but it is rarely studied. Among behavioural factors, the associations of non-smoking and physical activities are not unexpected, but the positive association of nutritional risk status with successful aging is worth noting, and has been investigated in very few studies[183].

There are presently no consensus and no uniform operational criteria to define successful aging. Whether a given set of operational criteria can universally tap the contents of successful aging is arguable. There may also be domain variations among multidimensional models of successful aging depending on the interventional perspectives and framework. Studies vary in the way constituents of successful aging are used as precursors or outcomes. Thus, alike some studies, I have considered life satisfaction to be a component of successful aging, but this was used as a predictor in other studies[145]. In some studies, participation in leisure activities was not included as a defining

component of successful aging, but was found to 'predict' successful aging[110,145].

Despite using a broad model and less stringent criteria (did not use absence of disease or illness), less than 30% (n=366) were classified as ageing successful using the multidimensional model of successful ageing. However, since various studies have used different criteria in defining and measuring successful ageing that result in a wide range of reported prevalence of successful ageing from 0.4% to 95%[24], the prevalence of successful ageing reported in this study cannot be meaningfully compared. Given that different criteria are used to define successful aging in various studies, there is also debate about the appropriate cut-off points in measures used. Previous studies that have also used maximum/optimum cut-off scores based on various biomedical and other models[17] have variously reported the prevalence of successful aging at between 16% and 34%. Our operational criteria used to define successful aging, based on the maximum score (4/4) for the proposed model, was similarly restrictive, and it generated a prevalence figure within the range of these reported figures. There is arguably a universal case for a less restrictive definition and criteria since seniors may still consider themselves to be aging well because of their transcending experience of positive psychological and social well-being despite deteriorating health and physical functioning[184]. This will increase the distribution of successful aging to a majority of the population, but the appropriate normative level requires further investigation and consensus[19]. Past research[28,19] rarely measures successful ageing with a self-rating scale which may be superior because it lies on a continuum. Therefore, older adults will be allowed to subjectively rate

themselves unbounded by any criteria. Therefore, I will examine the validity and reliability of using a self-rated single-item scale of global successful ageing in the next study (study II).

There are other limitations to this study as well. The use of some measures and cut-offs such as MMSE ≥26 and GDS <5 does not identify successfully aging participants who are at the highest level of cognitive and emotional functioning and wellbeing. There was likely bias from loss to follow up in the longitudinal analysis; participants in the follow up study tended to be in better health and functioning. Because of their better aging profile, the observed association with quality of life may be under-estimated. The number of medical comorbidities was not based on self-report of medical conditions. Nevertheless, previous research has shown that self-report of most chronic illnesses are valid and useful for research[185,186]. The strengths of the study include the large, population-based sample and the use of a multiplicity of measures that are less often present in other studies.

Compared to studies based on more restricted biomedical definitions of successful aging that showed a preponderance of health-related determinants, this study identified more demographic, psychosocial and behavioural determinants including nutrition and spirituality in a multidimensional construct of successful aging among Chinese elderly populations. This is pertinent to shaping a holistic approach to aged care and designing multi-faceted interventions in population-based programmes.

In summary, although I formulated and validated a broader construct of successful ageing, it is glaring that the construct remains restrictive as less

than 30% of participants were regarded as successful agers. Therefore caution

should be taken in interpreting the prevalence of successful ageing reported in

this study.   However, because very little is known about successful ageing in

Singapore, findings from this study contributed important empirical

information findings on successful ageing in Singapore in its attempts to

operationalize the concept, describe the prevalence and determine its

correlates based on a large sample size (although the sample size could be

large enough to produce a sufficient statistical power, results should be

interpreted cautiously).

The use of a self-rated single-item scale of global successful ageing will be

tested in the following study, study II.

CHAPTER 5

RESULTS & DISCUSSION: Study II

This chapter reports findings from study II. The aim of this study was evaluate the construct and criterion validity of a self-rated single-item scale of global successful ageing that ranged from one to 10, in Singaporean older adults aged 65 and above. Reliability of the scale was also examined.

5.1 Results

Demographics

500 participants were recruited for this study with a response rate of 88.6%. After data screening, data from 489 participants were used for analyses. Study sample characteristics are shown in **Tables 5a and 5b**. The mean age of study participants was 72.2 (SD=5.7), there were slightly more females (60.1%), and majority were of Chinese ethnicity (85.1%). About half were currently married (54%) and almost 80% of participants reported receiving six years or less of education.

Subjective rating of successful ageing and other variables

As presented in **Table 5b**, on a scale of 1-10 of successful ageing using the self-rated single item scale, the mean score of self-rated SA was 6. 8 (SD=1.6) and ranged from the lowest two to highest 10.

Among the participants (see **Tables 5a and 5b**): majority reported good health (*n*=353, 72%) and were physically healthy and independent (*n*=377, 77%); almost all (*n*=442, 90%) reported no depressive symptoms; the

mean of general satisfaction with life was high (M=24.5, SD=5.7); the mean of quality of life was (M=54.3, SD=.7.1) for SF-36 MCS and (M=47.5, SD=8.1) for SF-36 PCS; for religiosity score (M=11.7, SD=8.3); resilience (M=60.3, SD=1.4); optimism (M=20.1, SD=2.4); and mastery score (M=19.2, SD=2.4).

Relationship between self-rated single-item scale of global successful ageing and dimensional models of successful ageing [construct validity]

To assess construct validity, Pearson's correlation coefficient were computed to assess the relationship between self-rated single-item scale of global successful ageing and each of the five dimensional models of successful ageing. All five models were positively correlated with self-rated single-item scale of global successful ageing. Psychological model was the most strongly correlated r=0.39, n=478, p<0.001, followed by mental well-being model r=0.27, n=433, p<0.001, physical health and function model r=0.18, n=457, p<0.001, social functioning model r=0.14, n=457, p<0.01 and spirituality model r=0.11, n=489, p<0.05, respectively.

Subsequently, to further examine these associations, linear regression analyses were conducted to determine the contribution of each of the five dimensional models made in self-rated single-item scale of global successful ageing **(Table 6)**. Each of the specific dimensions was also added hierarchically in sequence into a multi-dimensional construct to examine the unique contribution of each specific dimension **(Table 6)**. Similar to findings from correlations shown above, results showed that psychological dimension accounted for the most variance (R^2= 15.6%), followed by mental well-being

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model ($R^2 = 7.3\%$), physical health and function model ($R^2 = 3.3\%$), social functioning model ($R^2 = 1.9\%$) and spirituality model ($R^2 = 1.2\%$) respectively**.**

In hierarchical models, the sequential inclusions of specific mental, social, psychological, and spiritual dimensions onto the base biomedical model (physical health and functioning) resulted in statistically significant incremental increase in the variance of self-rated single-item scale of global successful ageing (model R-squared values) from 3.3% to 16.7% . The complete multi-dimensional measure of SA using all five components accounted for almost 17% of the variance in self-rated SA.

Prediction of life satisfaction and quality of life (criterion validity)

Using linear regression analyses, I evaluated the criterion validity of the self-rated single-item scale of global successful ageing by comparing how well it predicts outcome measures of life satisfaction and quality of life, as compared to dimensional models of successful ageing **(Table 7)**. Overall, findings showed that all models were significant predictors of life satisfaction and quality of life.

For outcome measures of life satisfaction, as compared with other dimensional models of successful ageing, the self-rated single-item scale of global successful ageing was the strongest predictor of the two measures of life satisfaction: global self-satisfaction (*beta*=.54; R^2=28.9%) and SWLS (*beta*=.51; R^2=26.3%).

For outcome measures of quality of life as measured by SF-36 MCS, results showed that the psychological dimensional model was the best

predictor (*beta*=.43; R^2=18.8%), while the self-rated single-item scale of global successful ageing was second best predictor (*beta*=.37; R^2=13.6%). However, on the prediction of quality of life as measured by SF-36 PCS, the self-rated single-item scale of global successful ageing was the worst predictor (*beta*=.28; R^2=7.7%); while the best predictor was the biomedical dimensional model (*beta*=.49; R^2=23.8%).

Correlates of successful ageing

To identify socio-demographic independent correlates of the self-rated single-item scale of global successful ageing and dimensional models of successful ageing, stepwise regression analyses were performed **(Table 8)**. Results showed that the self-rated single-item scale of global successful ageing was independent of age, gender, education, housing type and marital status; the only significant correlate was Indian ethnicity, $F(1, 438)$=7.55, *p*=.006.

Reliability of the self-rated single-item scale of global successful ageing

Test-retest reliability of the self-rated single-item scale of global successful ageing was assessed with 33 older adults (**Table 9**). Participants has a mean age of 73(*SD*=5.68); there were slightly more females (*n*=23, 70%) about half were currently married (*n*= 17); very few were living along (*n*=4, 12%) and about 75% (*n*=23) reported receiving some form of education.

There was an average of 13 days (*SD*=1.24) between first and second time-points of administration of the self-rated single-item scale of global successful ageing. The mean of the first rating was 7.30 (*SD*=2.24) and the

mean of the second rating was 7.23 (*SD*=2.23) and were very high correlated,

r=0.93, *n*=33, *p*<0.001.

Table 5a. Characteristics of Study Sample (N=489)

		N	%
		Mean	(SD), range
Gender	Female	294	60.1
	Male	195	39.9
Ethnicity	Chinese	416	85.1
	Malay	52	10.6
	Indian	21	4.3
Marital Status	Single	31	6.3
	Married	263	53.8
	Widowed	161	32.9
	Separated, divorced	30	6.1
Living arrangement	Alone	104	21.3
	With spouse/children	355	72.6
	With friends, others	26	5.3
Education	6 years or less	378	78.9
	More than 6 years	101	20.7
Housing type	2-room or smaller	147	30.1
	3-room or larger	321	65.6
Chronic illness	More than 3	43	8.8
Self-rated health	Good to excellent	353	72.2
GDS-15 score <5		442	90.4
IADL (8 items)	Independent on all items (0)	377	77.1

Test: Descriptive statistics for mean and proportion.
GDS-15: Geriatric Depression Scale, summed scores ranged from -15. Participants with scores of 5 and above were considered to have depressive symptoms
IADL: Instrumental Activities of Daily Living with 8 items. Functional independence was defined by not needing any help in any of the 8 items.

Table 5b. Characteristics of Study Sample (N=489)

	N % Mean (SD), range
Age, mean (years)	72.2 (5.7), range 65-93
Self-rated successful ageing	6.8 (1.6); 2-10
Social/productive/physical activities score	11.0 (4.82); 1-24
Social support score	16.7 (3.7); 4-21
Cognitive failure scores	61.8 (9.8);21-80
Resilience score	60.3 (11.4); 18-100
Mastery score	19.2 (2.4); 11-38
Optimism score	20.1 (2.4);14-27
Religiosity and spirituality score	11.7 (8.3); 0 -25
SF-36 MCS	54.3 (7.1);24.76-67.92
SF-36 PCS	47.5 (8.1); 19.82-60.50
Global life-satisfaction	7.1 (1.9);1-10
SWLS score	24.5 (5.7); 8-25

Test: Descriptive statistics for mean and proportion.
Self-rated successful ageing: Self-rated single-item scale of global successful ageing (10-point scale), lower scores indicate less successful ageing.
Social/productive/physical: Frequency of participating in54 different listed activities during past month on a 6-point scale (higher scores indicate more participation).
Cognitive failure: 20 items from the Cognitive Failure Questionnaire (5-point scale); summated scores ranged from 0-80, with higher score indicating better cognition.
Resilience: 25-item Connor-Davidson Resilience scale (5-point scale). Summated scores ranged from 0-100, with higher scores indicating greater resilience.
Mastery: Seven-item Pearlin Mastery Scale (4-point scale). Higher summated scores indicate greater mastery.
Optimism: Six-item Life Orientation Test-revised (5-point scale). Higher summated scores indicate greater optimism.
Religiosity/spirituality: Five-items based on 6-point scale. Greater summated scores indicated increased spiritual/religious engagement.
SF-36 MCS: Short-Form Health Survey- Mental Component Score; scores ranged from 0-100, with higher scores indicating better outcome
SF-36 PCS: Short-Form Health Survey-Physical Component Score; scores ranged from 0-100, with higher scores indicating better outcome
Global life-satisfaction: Life-satisfaction at present older adult life stage [single item, scale from 1-10; higher scores indicate higher satisfaction]
SWLS: The Satisfaction with Life Scale (5 items), scored on 7-point scale. Higher summated scores indicate better satisfaction.

Table 6. Regression analyses of self-rated single-item scale of global successful ageing scores (dependent variable) predicted by dimensional measures of successful ageing (N=489)

Independent variables: successful ageing models	Stand. Beta	P	F-test value	df	R^2	R^2 Change
Uni-dimensional models						
Physical health and function	.182	<.001	15.6	1,456	.033	
Mental well-being	.270	<.001	33.8	1,432	.073	
Social functioning	.139	<.01	8.92	1,456	.019	
Psychological	.394	<.001	87.7	1,477	.156	
Spirituality/religiosity	.110	<.05	6.0	1,488	.012	
Multi-dimensional models						
Physical health and function	.182	<.001			.033	.033
Physical health and function + Mental	.273	<.001	33.9	1,421	.075	.042**
Physical health and function + Mental + Social	.297	<.001	38.0	1,393	.088	.013**
Physical health and function + Mental + Social + Psychological	.383	<.001	66.2	1,386	.147	.059**
Physical health and function + Mental + Social + Psychological + Spirituality/religiosity	.409	<.001	77.4	1,386	.167	.020**

Test: Linear regression models
Total Multiple R-squared: 0.167
Physical health and function= Summed scores of : IADL+ Chronic Illness+ Self-reported health status
Mental wellbeing= Summed scores of: Cognitive Failures Questionnaire+GDS-15+Self-reported mental health
Social functioning= Summed scores of: Leisure-time physical, social and productive activities+ Social support/network from friends and family
Psychological= Summed scores of : CD-RISC (Resilience)+ Pearlin Mastery scale+Life orientation test (Optimism)
Spirituality/Religiosity= Summed scores of engagement in activities relating to spirituality/religiosity using 5 –items.

Table 7. Regression analyses of successful ageing models as predictors of life satisfaction and quality of life (N=489)

Successful ageing models	Global Self-satisfaction				Satisfaction with Life [SWLS]				SF-36 (PCS)				SF-36 (MCS)			
	Beta	*F*	d*f*	R²	Beta	*F*	d*f*	R²	Beta	*F*	d*f*	R²	Beta	*F*	d*f*	R²
Biomedical	.294**	39.4	1,419	.086**	.223**	21.9	1,421	.050**	.488**	131.5	1,421	.238**	.291**	38.9	1,421	.085**
Social- Functioning	.225**	24.0	1,453	.050**	.252**	30.9	1,455	.064**	.302**	45.7	1,455	.091**	.212**	21.5	1,455	.045**
Psychological	.400**	90.3	1,474	.160**	.411**	96.4	1,476	.169**	.318**	53.5	1,476	.101**	.433**	110.1	1,476	.188**
Biopsychosocial	.441**	92.6	1,384	.195**	.409**	77.5	1,386	.167**	.457**	101.7	1,386	.209**	.364**	58.7	1,386	.132**
Self-rated global SA	.537**	196.6	1,484	.289**	.512**	173.2	1,487	.263**	.278**	40.8	1,487	.077**	.369**	76.7	1,487	.136**

Test: Linear regression analyses.

F:F-test value

Biomedical Model= Summed scores of: Physical health and function (IADL+ Chronic Illness+ Self-reported health status) + Mental wellbeing(Cognitive Failures Questionnaire+GDS-15+ Self-reported mental health)

Social Functioning Model= Summed scores of: Leisure-time physical, social and productive activities + Social support/network from friends and family

Psychological Model= Summed scores of CD-RISC (Resilience) + Pearlin Mastery scale + Life orientation test (Optimism)

Biopsychosocial Model= Summed scores of all the above + spirituality/religiosity (Amount of engagement in such activities measured with 5-items)

Self-rated global SA= Self-rated single-item scale of global successful ageing (10-point scale), lower scores indicate less successful ageing.

Global self-satisfaction= Self-rated single-item scale: "How satisfied were you during the following time in your life: Older adulthood (65+ years)", on a 10-point scale (1=Not at all satisfied to 10=very satisfied).

SWLS= Satisfaction with Life scale with 5-items rated on a 7-point scale.   Higher summated scores indicate greater satisfaction.

SF-36 MCS= Short-Form Health Survey Physical Component Score. Scores ranged from 0-100, with higher scores indicating better physical health related quality of life.

SF-36 PCS= Short-Form Health Survey Mental Component Score.   Scores ranged from 0-100, with higher scores indicating better mental health related quality of life.

**p<.001

Table 8. Stepwise regression analyses of significant independent correlates of global and dimensional measures of successful ageing (dependent variables)

Model	Correlates	Unstandardized beta	Standardized beta	*t*-test	*df*	*p*
Biomedical	Age	.659	.242	4.98	1	.000
Social functioning	Education	.510	.221	4.72	1	.000
	Age	.644	.182	3.99	1	.000
	Housing type	.284	.139	2.92	1	.004
	Gender	-.321	-.157	-3.26	1	.001
	Marital status	.258	.127	2.60	1	.010
Psychological	Education	.408	.184	3.87	1	.000
	Housing	.287	.144	3.02	1	.003
	Indian ethnicity	-.494	-.100	-2.14	1	.033
Biopsychosocial	Age	.577	.271	5.55	1	.000
	Education	.166	.132	2.66	1	.008
	Malay ethnicity	.339	.169	3.43	1	.001
	Housing type	.133	.116	2.30	1	.022
Self-rated global SA	Indian Ethnicity	-1.011	-.130	-2.75	1	.006

Test: Stepwise multiple regression analyses, with final models shown.

Candidate predictor variables: Age : 80+(0) vs 65-80 (1); Gender: Female (0) vs males (1); Education: <6 years (0) vs >6 years (1); Housing Type: 3-rm or small (0) vs larger than 3-rm (1); Marital Status: Widowed, single, divorced, separated (0) vs married (1);   Ethnicity 1: Chinese (0) Malay (1); Ethnicity2: Chinese (0) Indian (1)

Biomedical Model= Summed scores of: Physical health and function (IADL+ Chronic Illness+ Self-reported health status) + Mental wellbeing(Cognitive Failures Questionnaire+GDS-15+ Self-reported mental health)

Social Functioning Model= Summed scores of: Leisure-time physical, social and productive activities + Social support/network from friends and family

Psychological Model= Summed scores of CD-RISC (Resilience) + Pearlin Mastery scale + Life orientation test (Optimism)

Biopsychosocial Model= Summed scores of all the above + spirituality/religiosity (Amount of engagement in such activities measured with 5-items)

Self-rated global SA= Self-rated single-item scale of global successful ageing (10-point scale), lower scores indicate less successful ageing.

Table 9. Characteristics of study sample for test-retest reliability of the self-rated single-item scale of global successful ageing (N=33)

		Percentage (n)
Age, mean(sd)		73.03 (5.68), range 65-84
Gender	Male	30.3 (10)
	Female	69.7 (23)
Marital Status	Single, never married	9.1 (3)
	Married	51.5 (17)
	Separated	3.0 (1)
	Divorced	6.1 (2)
	Widowed	30.3 (10)
Living Arrangement	In the community, Alone	12.1 (4)
	In the community,	75.8 (25)
	In the community, with relative,	9.1 (3)
	In the community, with friends	3.0 (1)
Highest Educational	Nil	24.2 (8)
	Primary	39.4 (13)
	Secondary	30.3 (10)
	Polytechnic/ Pre-U	6.1 (2)
Time Interval between		13 (1.24), range 11-17
1st Rating, mean(sd)		7.30 (2.24), range 3-10
2nd Rating, mean(sd)		7.27 (2.23) , range 3-10

Test: Descriptive statistics

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5.2 Discussion

The findings of study II address the validity and reliability of using a self-rated single-item scale of global successful ageing in measuring subjective successful ageing with Singaporean older adults aged 65 and over.

Consistent with the prediction, the self-rated single-item scale of global successful ageing demonstrated good construct validity as it was positively correlated with each of the five dimensions associated with successful ageing (biomedical, social-functioning, psychological well-being and spirituality/religiosity). This finding was in line with the assumption that a global measure of successful ageing encompassed the spectrum of underlying specific dimensions of successful ageing. Furthermore, its strong association with the psychological dimension accord with the observations from other studies indicating that older adults strongly identified psychological factors, more than physical well-being to be especially important for ageing well[25,19].

The validity of the scale was further demonstrated by its ability to predict outcome measures of life satisfaction and quality of life. Life satisfaction and quality of life bear close semantic resemblance to successful ageing, and are sometimes viewed as precursors, constituents or indicators of successful ageing[2]. In particular, I found that the self-rated single-item scale of global successful ageing was the best predictor of life satisfaction as compared to other successful ageing dimensions. Therefore, the criterion-based validation of the self-rated single-item scale of global successful ageing was supported by the findings reported in this study.

Two studies that used similar self-ratings of successful ageing reported that majority of participants perceived themselves to have aged successfully but few would actually fulfill researcher-defined criteria[28,19].   Similarly, these findings indicated that a large proportion of the underlying dimension(s) of self-rated single-item scale of global successful ageing remains unaccounted for. This attests to the 'broadness' of the scale, thus allowing it to capture information or dimensions that were unknown or neglected by researchers, and supporting the notion that most multidimensional models of successful ageing remained restrictive and lack subjective input. Although, this large proportion of unaccounted variance in self-rated successful could possibly reflect the inherent limitations of the measurement of these dimensions, it could also very well have resulted from unmeasured or unknown domains in the dimensional construct of successful ageing.   This further reflects the difficulty of using operationalized dimensional models in assessing successful ageing as measurements used varied widely[24].

This study found different sets of correlates of successful ageing for the self-rated single-item scale of global successful ageing and dimensional measures of successful ageing. It is particularly meaningful to note that the self-rated single-item scale of global successful ageing was not associated with most socio-demographic variables such as chronological age, gender, education, and socio-economic status (except Indian ethnicity). Our finding is consistent with the subjective perspective of successful ageing, and the underlying notion that a global construct of successful ageing, transcends the limitations of demographic, socio-economic and health status. Thus, its non-dependence on

chronological age, gender, education, and socio-economic status is arguably a desirable attribute in a measurement tool for use in many situations.

The observed lack of associations may not be surprising as correlates of successful ageing have been found to be fairly inconsistent across studies[24], possibly explained by cultural perceptions of ageing. Two previous U.S. studies have used the self-rated single-item scale of global successful ageing. The first study[28] like this study found that self-rated successful ageing was not related to chronological age, gender, ethnicity, marital status, education or income, whereas the second study[29] found that self-rated successful ageing was related to chronological age and education. In different populations and culture, therefore, it is possible that, depending on the relative importance of underlying domain components of successful ageing and the relative prevalence of their correlates, self-rated successful ageing may have a few demographic correlates. This should be examined in future studies.

Indian ethnicity emerged as the only significant negative correlate of the self-rated single-item scale of global successful ageing. This ethnic group comprised the smallest percentage of the sampled population (4.3%). Indian ethnicity was also a significant negative correlate of successful ageing in the psychological model, and this is consonant with the parallel finding that self-rated successful ageing was most correlated with psychological functioning. Only Malay ethnicity was a significant positive correlate of successful ageing in the biopsychosocial model, but not in the global successful ageing model. Similarly, a study examining successful ageing among Malaysians identified ethnicity as a predictor of successful ageing, whereby older Indians was associated with a lower likelihood of ageing successfully as compared to

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Chinese participants.   However, these findings should be interpreted with caution due to the small sample size of Malay and Indian participants.

Existing literature have also attested to the importance of culture as a cross-cutting factor in successful ageing. Culture embraces systems of ideas, values, and customs in regard to the ageing process that influence societal expectations and behaviours toward older people[187] , and older individuals' personal views, expectations, and adaptations in regard to their own aging process and well-being[147,32]. Further studies of the ethnic differences and cultural dimensions of self-rated successful ageing are desirable.

The present study concurs with previous studies[28,19] that have also used a simple analogue scale in supporting the validity of subjective self-ratings as a measure of successful ageing. This has important implications for policies and programmes that aim to promote successful ageing. Although criterion-based objective measures based on multi-dimensional constructs are potentially useful, but they are either narrow in their focus on specific domains, or continue to defy clear domain definitions or present practical limitations in measurements.

Although the self-rated single-item scale of global successful ageing tested in this study may appear to be overly ambitious, self-rating of successful ageing along a continuum is both a sensitive and comprehensive measure of successful ageing, capturing implicit information that is not readily extracted with explicit criteria-based measures. The use of a subjective self-rating scale is reflective of successful ageing as primarily a value judgment held by elderly respondents themselves. With strong psychometric validation, self-rated

successful ageing derived from a simple global measurement tool may thus be recommended as a universally acceptable standard measurement of global successful ageing for use in comparative analyses.

In the next study (study III), I will explore gender and ethnic differences on variables associated with successful ageing, including the self-rated single-item scale of global successful ageing, which was validated in this study (study II).

CHAPTER 6

RESULTS & DISCUSSION: Study III

This study reports findings from study III. The aim of this study was to examine gender and ethnic-based differences in subjective ratings on the self-rated single-item scale of global successful ageing and in relation to variables associated with successful ageing: ageing perceptions; mortality salience and spirituality; health status; and life satisfaction. Ranking of important influential factors on successful ageing were also examined. These variables were found to be associated with successful ageing and I would like to examine gender and ethnic influences on these variables as perception of successful ageing is influenced by socio-cultural variations.

6.1 Results

Demographics:

500 participants were recruited for this study with a response rate of 88.6%. After data screening, data from 495 participants were used for analyses. Study sample characteristics were analysed using Chi-square tests and ANOVA (see **Table 10**). The overall average age was 72 (*SD*=5.9) and remains the same for across gender and ethnicity. There was slightly more females (*n*=294, 59 %). Majority were Chinese (*n*=422), 11% were Malay (*n*=52) and 4% were Indian (*n*=21).

About 46% of participants reported being currently married (*n*=268) and there were significantly more men (*n*=147) who reported being currently married as compared to women (*n*=123), $X^2(1, N=493) =49.2$, *p*<.001. No gender-based

differences in marital status were found. Majority of participants reported receiving six years or less of education (*n*=357, 72 %) and women reported receiving lesser education compared to men, X^2(1, *N*=493) =10.6, *p*=001. Ethnic differences were found for educational level, X^2(2, *N*=492) =6.01, *p*=.05. As compared with Chinese (*n*=118, 28 %) and Malay (*n*=10, 19.2 %) participants, higher proportion of Indian participants reported receiving higher educational qualifications (*n*=10, 48 %). About 80% of participants reported living with someone in the community (*n*=391), and there a slightly higher proportion of females living alone (*n*=73) than men (*n*=31), X^2(1, *N*=493) =6.37, *p*=.012.

Descriptive statistics on study variables associated with successful ageing

Study variables were analysed using Chi-square tests and ANOVA and presented in **Table 11.** On a scale of 1-10 of successful ageing using the self-rated single item scale, the mean score of self-rated SA was 6. 8 (*SD*=1.6) and ranged from the lowest two to highest 10.

Gender differences on subjective ratings of successful ageing and other variables associated with successful ageing

Chi-square and ANOVA tests were used to examine gender differences on variables associated with successful ageing, and results are illustrated in **Table 12**. As compared to men, women rated themselves as ageing more successfully, *F*(1, 494)=8.23, *p≤.01*, were more likely to expect things to worsen with age, X^2(1, *N*=494) =4.72, *p≤.05*, were more engaged in religious activities, *F*(1, 493)=10.9, *p≤.01*, faced more limitations in performing tasks related to physical functioning, *F*(1, 491)=11.1, *p≤01*, and were more

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satisfied with relationships with others, $F(1, 493)=12.0$, $p\leq01$, and finances, $F(1, 493)=12.9$, $p\leq01$.

Even after controlling for the effects of age and ethnicity on these associations using linear and logistic regressions, these gender-based differences remained significant (**Tables 13a and 13b**).

Gender differences on ranking of important influential factors for successful ageing

Participants voted for important influential factors for successful ageing out of 11 choices, and the results are shown in **Table 12.** No gender differences were found for the five most influential factors on successful ageing and these factors were physical health, financial stability, positive outlook, healthy diet and close friends/family, respectively. Overall, physical health was voted as the most important factor for vast majority of males ($n=175$, 87%) and females ($n=250$, 85%). Higher proportion of males considered mental activities $X^2(1, N=147)=4.81$, $p\leq.05$ and work satisfaction, $X^2(1, N=102)=4.32$, $p\leq.05$, as important factors for successful ageing as compared to female participants.

Ethnic differences on subjective ratings of successful ageing and other variables associated with successful ageing

Chi-square and ANOVA tests were used to examine ethnic differences on variables associated with successful ageing, and results are illustrated in **Table 14**. Interestingly, as compared to other ethnicities, Malay participants rated themselves highest on successful ageing, $F(2, 493)=4.11$, $p\leq.05$, and life

satisfaction, $F(2,491)=4.72$, $p \leq .01$, and yet were more limited in performing physical activities, $F(2, 490)=16.4$, $p \leq .01$. They also spent the most amount of time engaging in religious activities, $F(2, 492)=90.5$, $p \leq .01$, and thinking about death, $F(2, 489)=80.7$, $p \leq .01$.

Ethnic differences on ranking of important influential factors for successful ageing

Ethnic differences on ranking of important factors for successful ageing (out of 11 choices) are shown in **Table 14.** Physical health, financial stability, healthy diet and close friends/family were chosen to be in the top five influential factors across ethnicities. Ethnic-differences were found on five factors. Financial stability was more important for Indian and Malay participants, $X^2(2, N=368)=18.0$, $p \leq .01$. Higher proportion of Chinese considered positive outlook, $X^2(2, N=291)=46.1$, $p \leq .01$, and mental activities, $X^2(2, N=146)=9.54$, $p \leq .01$, as influential factors as compared to Malay and Indian participants. More Malay participants voted fulfilling marital/significant relationships as important factors for successful ageing than Chinese and Indians, $X^2(2, N=143)=14.1$, $p \leq .01$.

When asked to vote for the most important factor, physical health was voted as the most influential factor on successful ageing across ethnicities, except for Indian participants who voted it as the second most important factor after financial stability.

Significant correlates of self-rated successful ageing

As presented in **Table 15,** stepwise linear multiple regression analyses were used to identify significant independent predictors of self-rated successful ageing in whole sample, males, females, Chinese and Malays (Indian participants were omitted due their small sample size). Variables that do not contribute independently to explaining variance in the successful ageing measures were removed. Different sets of predictors of successful ageing were found for different ethnicities and gender. Further examination showed that satisfaction with relationships appeared as correlate for only Malays, $t(1)=4.68$, $p=.04$.

Table 10. Demographic profile of participants by gender and ethnicity [N=495]

	Total	Male	Female	Test value	df	p	Chinese	Malay	Indian	Test value	df	p
Numbers	495	201(40.6)	294(59.4)		493		422(85.3)	52(10.5)	21(4.2)		492	
Mean age (SD)	72.1 (5.9) ; range: 65-91	72.4 (5.7); range: 65-91	71.9 (6.0) ; range: 65-91	.992	1	.320	72.1 (5.9) ; range: 65-91	71.8 (5.9) ; range: 65-91	72.3 (4.0) ; range: 65-84	.09	2	.192
Marital status				49.2	1	<.001				1.99	2	.370
Currently married	268 (45.9)	147(73.1)	121(41.2)				234(55.5)	24(46.2)	10(47.6)			
Others: Never married , Separated; Divorced; Widowed; Unknown	227 (54.1)	54 (26.9)	173(58.8)				188(44.5)	28(53.8)	11(52.4)			
Employment				1.87	1	.172				1.21	2	.546
Employed full-time or part-time	64 (12.9)	31 (15.4)	33 (11.2)				55(13.0)	5 (9.6)	4 (19.0)			
Others: Retired; Homemaker; Unemployed; Volunteer; Unknown	431 (87.1)	170(84.6)	261(88.8)				367(87.0)	47(90.4)	17(81.0)			
Highest Education				10.6	1	.001				6.01	2	.05
6 years or less	357 (72.1)	129(64.2)	228(77.6)				304(72.0)	42(80.8)	11(52.4)			
More than 6 years	138 (27.9)	72 (35.8)	66 (22.4)				118(28.0)	10(19.2)	10(47.6)			
Living arrangement				6.37	1	.012				3.27	2	.195
Alone	104 (21.0)	31 (15.4)	73 (24.8)				94(22.3)	6 (11.5)	4 (19.0)			
With someone: spouse /children/ friends / others	391 (79.0)	170(84.6)	221(75.2)				328(77.7)	46(88.5)	17(81.0)			

Test: Pearson chi-square tests of significance for dichotomous variables and analysis of variance (ANOVA) for continuous variable.

Table 11. Descriptive statistics on test variables

	N Mean	% (SD), range
Ageing perceptions		
Subjective perception of age		
Feel older	46	9.3
Same	243	49.1
Feel younger	206	41.6
"Things keep getting worse as I get older": Disagree	227	45.9
"As I get older, I am less useful": Disagree	302	61.1
Feel discriminated by age: yes	75	15.2
Value quality of life: yes	396	80.3
Mortality salience and spirituality		
To what extent you think about death?	1.64	(0.8); 1-4
To what extent you fear death?	1.44	(0.7); 1-4
Religious/spirituality engagement	11.7	(8.2); 0-25
Health status		
Self-rated general health	2.81	(0.7); 1-3
No. of chronic diseases	1.75	(1.4); 0-8
Mental health functioning	2.84	(0.6); 1-4
Limitations in physical functioning activities	10.4	(1.8); 4-12
Life Satisfaction		
Overall satisfaction with life (SWLS):	24.4	(5.7); 8-25
Satisfaction with relationships (friends and relatives)	6.85	(1.8); 1-3
Satisfaction with finances	6.30	(1.9); 1-3
Self-rated successful ageing (1-10)	6.79	(1.60); 2-10
Five most influential factor on successful ageing for me		
Physical health	425	85.9
Financial stability	370	74.9
Positive outlook	293	59.3
Healthy diet	274	55.6
Close friends/family	270	54.8
Physical exercise	201	40.6
Good genes	157	31.8
Mental activities	148	30.0
Fulfilling marital/ significant relationships	145	29.5
Adapting well to change	123	24.9
Work satisfaction	103	20.9
Most influential factor on successful ageing for me		
Physical health	249	50.5
Financial stability	42	8.5
Positive outlook	38	7.7
Close friends/ family	38	7.7
Healthy diet	33	6.7
Fulfilling marital/ significant relationships	31	6.3
Adapting well to change	17	3.4
Good genes	14	2.8
Physical exercise	14	2.8
Mental activities	10	2.0
Work satisfaction	7	1.4

Test: Descriptive statistics for mean and proportion

Feel discriminated by age: "Within the past 30 days, have you felt emotionally upset as a result of how you were treated based on your age?" (Yes/No)

Value quality of life: "I want to preserve a good quality of life even if I may not live as long"(Yes/No)

To what extent you think about death? (1=Never to 10=All the time)

To what extent you fear death? (1=Not at all to 10=Very much)

Religiosity/spirituality: 5-items, summed scores from 0-25 with higher scores indicating greater engagement

Self-rated general health : "In general, would you say your health is"(1=poor to 5=excellent)

Self-rated mental health : "Comparing yourself with people of your own age, would you say your mental health is" (1=poor to 5=excellent)

Limitations in physical functioning activities: Four-items from the physical functioning domain from SF-36 (4=Yes, limited a lot to 12=No, not limited at all)

Overall satisfaction with life (SWLS; The Satisfaction with Life Scale): Scores ranged from 5 to 25, with higher scores indicating greater satisfaction

Satisfaction with relationships with others: "In general, how satisfied are you with your relationships with friends and relatives" (1=Not at all satisfied to 10=Very satisfied)

Satisfaction with finances: "In general, how satisfied are you with your finances?" (1= Not at all satisfied to 10=Very satisfied)

Self-rated successful ageing:The self-rated single-item scale of global successful ageing(1=least successful to 10=Most successful)

**$p=\leq.01$; *$p=\leq.05$

Self-rated level of successful ageing (1=least successful to 10=Most successful)
**$p=\leq.01$*$p=\leq.05$

Table 12. Gender differences in test variables and successful ageing.

	Male (*n*=201)	Female (*n*=294)	Test value	*df*
Ageing perceptions				
Subjective perception of age			3.18	2
Feel older	7.0(14)	10.9(32)		
Same	47.8(96)	50.0(147)		
Feel younger	45.2(91)	39.1(115)		
"Things keep getting worse as I get older": Disagree	51.7(104)	41.8(123)	4.72*	1
"As I get older, I am less useful": Disagree	61.5(123)	60.9(179)	.02	1
Feel discriminated by age: yes	15.0(30)	15.3(45)	.87	1
Value quality of life: yes	79.5(159)	80.9(237)	.15	1
Mortality salience and spirituality				
To what extent you think about death?(sd)	2.52(2.4)	2.91 (2.6)	2.89	1,491
To what extent you fear death?(sd)	2.08 (2.1)	2.21 (2.2)	.46	1,491
Religious/spirituality engagement (sd)	9.72 (8.4)	13.1 (7.9)	10.9**	1,493
Health status				
Self-rated general health (sd)	3.09 (3.6)	2.79 (.64)	1.71	1,493
No. of chronic diseases (sd)	1.74 (1.3)	1.75(1.40)	.10	1,491
Mental health functioning (sd)	2.84 (0.6)	2.84(0.62)	.13	1,492
Limitations in physical functioning activities(sd)	10.7 (1.7)	10.15(1.9)	11.1**	1,491
Life Satisfaction				
Overall satisfaction with life (SWLS): (sd)	24.0 (5.5)	24.6 (5.8)	1.41	1,492
Satisfaction with relationships (friends and relatives) (sd)	6.52 (1.9)	7.09 (1.7)	12.0**	1,493
Satisfaction with finances (sd)	5.93 (1.9)	6.55 (1.8)	12.9**	1,493
Self-rated successful ageing (1-10)	6.54	6.96	8.23**	1,494
Five most influential factor on successful ageing for me				
Physical health	87.1 (175)	85.0 (250)	1.84	1
Financial stability	75.5 (151)	74.5 (219)	.07	1
Positive outlook	54.5 (109)	62.5 (184)	3.80	1
Healthy diet	55.0 (110)	56.0 (164)	.05	1
Close friends/family	51.0 (102)	57.3 (168)	1.93	1
Physical exercise	44.3 (89)	38.1 (112)	1.89	1
Good genes	32.3 (65)	31.4 (92)	.05	1
Mental activities	35.5 (71)	26.3 (77)	4.81*	1
Fulfilling marital/ significant relationships	30.7 (61)	28.7 (84)	.23	1
Adapting well to change	24.9 (50)	24.9 (73)	0	1
Work satisfaction	25.5 (51)	17.1 (52)	4.32*	1
Most influential factor on successful ageing for me			29.9**	10
Physical health	45.0 (90)	54.3 (159)		
Financial stability	15.0 (30)	4.1 (12)		
Positive outlook	5.5 (11)	9.2 (27)		
Close friends/ family	8.0 (16)	7.5 (22)		
Healthy diet	8.5 (17)	5.6 (16)		
Fulfilling marital/ significant relationships	4.0 (8)	7.8 (23)		
Adapting well to change	2.5(5)	4.1(12)		

Good genes	3.5(7)	2.4(7)
Physical exercise	4.5(9)	1.7(5)
Mental activities	2.0(4)	2.0(6)
Work satisfaction	1.5(3)	1.4(4)

Test: Pearson chi-square tests of significance for dichotomous variables and analysis of variance (ANOVA) for continuous variable.

Feel discriminated by age: "Within the past 30 days, have you felt emotionally upset as a result of how you were treated based on your age?" (Yes/No)

Value quality of life: "I want to preserve a good quality of life even if I may not live as long"(Yes/No)

To what extent you think about death? (1=Never to 10=All the time)

To what extent you fear death? (1=Not at all to 10=Very much)

Religiosity/spirituality: 5-items, summed scores from 0-25 with higher scores indicating greater engagement

Self-rated general health : "In general, would you say your health is"(1=poor to 5=excellent)

Self-rated mental health : "Comparing yourself with people of your own age, would you say your mental health is" (1=poor to 5=excellent)

Limitations in physical functioning activities: Four-items from the physical functioning domain from SF-36 (4=Yes, limited a lot to 12=No, not limited at all)

Overall satisfaction with life (SWLS; The Satisfaction with Life Scale): Scores ranged from 5 to 25, with higher scores indicating greater satisfaction

Satisfaction with relationships with others: "In general, how satisfied are you with your relationships with friends and relatives" (1=Not at all satisfied to 10=Very satisfied)

Satisfaction with finances: "In general, how satisfied are you with your finances?" (1= Not at all satisfied to 10=Very satisfied)

Self-rated successful ageing:The self-rated single-item scale of global successful ageing(1=least successful to 10=Most successful)

**$p=\leq.01$; *$p=\leq.05$

Self-rated level of successful ageing (1=least successful to 10=Most successful)
**$p=\leq.01$*$p=\leq.05$

Table 13a. Associations of successful ageing variables with gender (1=female vs 0=male): age- and ethnicity-adjusted odds ratios (95% CIs] shown

Dependent variables	OR	β	SE	95% CI	*df*	Wald value	*P*
Ageing perceptions							
Subjective perception of age: don't feel younger (0) vs feel younger (1)	1.26	.23	.19	.87, 1.83	1, 494	1.45	.228
"Things keep getting worse as I get older: Agree (0) vs disagree (1)	1.53	.43	.14	1.06, 2.22	1, 494	5.19	.023*
"As I get older, I am less useful" : Agree (0) vs disagree (1)	1.09	.09	.19	.75, 1.59	1, 494	.19	.662
Feel discriminated by age: Yes (0) vs no (1)	1.02	.02	.26	.61, 1.70	1, 494	.05	.935
Value quality of life over longevity: No (0) vs yes (1)	1.08	.08	.23	.68, 1.72	1, 494	.12	.728

Test: Logistic regression for dichotomous dv while adjusting for age and gender (for clarity, only final models are shown).
**p=≤.01, *p=≤.05
Feel discriminated by age: "Within the past 30 days, have you felt emotionally upset as a result of how you were treated based on your age?" (Yes/No)
Value quality of life: "I want to preserve a good quality of life even if I may not live as long"(Yes/No)

Table 13b. Associations of successful ageing variables with gender (1=female vs 0=male): age- and ethnicity-adjusted odds ratios (95% CIs] shown

Dependent variables	Beta	SE	95% CI	df	Test value	*P*
Mortality Salience and Spirituality						
To what extent you think about death? ("1=Never" to "10=All the time)	.280	.20	-.11, .67	3,487	1.39	.164
To what extent do you fear death? ("1=Not at all" to "10=Very much)	.129	.19	-.24, .51	3,487	.68	.496
Religious/spirituality engagement	3.20	.63	1.96, 4.44	3,490	5.06	<.001*
Health Status						
Self-rated general health (1=poor to 5=excellent)	-.240	.21	-.66, .18	3, 490	-1.13	.260
No. of chronic diseases	.043	.13	-.20, .29	3, 487	.35	.730
Mental health functioning level	-.025	.06	-.14, .08	3, 489	-.46	.650
Limitations in physical functioning activities	-.553	.15	-.85, -2.53	3, 488	-3.62	<.001*
Life Satisfaction						
Overall satisfaction with life (SWLS)	.497	.52	-.53, 1.52	3, 489	.95	.340
Satisfaction with relationships (1-10)	.523	.16	.20, .85	3, 489	3.18	.002*
Satisfaction with finances (1-10)	.589	.17	.25, .93	3, 490	3.42	.001*
Successful Ageing						
Self-rated level of successful ageing(1-10)	.384	.15	.10, .67	3, 487	2.63	.009*

Test: Linear regression for continuous dv while adjusting for age and gender (for clarity, only final models are shown). **$p=\leq.01$, *$p=\leq.05$

To what extent you think about death? (1=Never to 10=All the time)
To what extent you fear death? (1=Not at all to 10=Very much)
Religiosity/spirituality: 5-items, summed scores from 0-25 with higher scores indicating greater engagement
Self-rated general health : "In general, would you say your health is"(1=poor to 5=excellent)
Self-rated mental health : "Comparing yourself with people of your own age, would you say your mental health is" (1=poor to 5=excellent)
Limitations in physical functioning activities: Four-items from the physical functioning domain from SF-36 (4=Yes, limited a lot to 12=No, not limited at all)
Overall satisfaction with life (SWLS; The Satisfaction with Life Scale): Scores ranged from 5 to 25, with higher scores indicating greater satisfaction
Satisfaction with relationships with others: "In general, how satisfied are you with your relationships with friends and relatives" (1=Not at all satisfied to 10=Very satisfied)
Satisfaction with finances: "In general, how satisfied are you with your finances?" (1= Not at all satisfied to 10=Very satisfied)
Self-rated successful ageing:The self-rated single-item scale of global successful ageing(1=least successful to 10=Most successful)

Table 14. Ethnic differences in test variables and successful ageing.

	Chinese (n=420)	Malay (n=52)	Indian (n=21)	Test value	df
Ageing perceptions					
Subjective perception of age				39.1**	2
Feel older	10.2 (43)	5.8(3)	0.0(0)		
Same	43.4(183)	84.6 (44)	76.2 (16)		
Feel younger	46.4 (196)	9.6 (5)	23.8 (5)		
"Things keep getting worse as I get older": Disagree	49.1 (207)	32.7 (17)	14.3 (3)	13.8**	2
"As I get older, I am less useful": Disagree	62.6 (264)	61.5 (32)	30.0 (6)	8.52*	2
Feel discriminated by age (yes)	13.8 (58)	21.2 (11)	28.6 (6)	6.32	2
Value quality of life: (yes)	82.4 (346)	73.1 (38)	57.1 (12)	10.0**	2
Mortality salience and spirituality					
To what extent you think about death?(sd)	2.24 (2.0)	6.13 (3.2)	4.48 (2.6)	80.7**	2, 489
To what extent you fear death? (sd)	1.92 (1.9)	3.27 (2.7)	4.14 (2.8)	20.12**	2, 489
Religious/spirituality	9.95 (7.4)	22.4 (3.4)	20.7 (4.2)	90.5**	2, 492
Health status					
Self-rated general health:(sd)	2.84 (.65)	2.79 (.54)	2.38 (.65)	6.53**	2, 493
No. of chronic disease (sd)	1.69 (1.3)	1.92 (1.6)	2.38 (1.1)	3.05*	2, 489
Mental health functioning level (sd)	2.84 (0.6)	2.98 (0.6)	2.48 (0.6)	5.10**	2, 491
Limitations in physical functioning activities (sd)	10.5 (1.7)	9.1 (1.9)	9.9 (1.8)	16.4**	2, 490
Life Satisfaction					
Overall satisfaction with life (sd)	24.1(5.6)	26.6 (5.8)	23.2(6.5)	4.72**	2, 491
Satisfaction with relationships (friends and relatives)(sd)	6.77 (1.8)	7.67 (1.3)	6.48 (2.2)	6.29**	2, 491
Satisfaction with finances:(sd)	6.31 (1.9)	6.42 (1.7)	5.76 (2.8)	.95	2, 492
Self-rated successful ageing)(sd)	6.8 (1.6)	7.2 (1.5)	6.0 (1.8)	4.11*	2, 493
Five most influential factors for successful ageing for me are					
Physical health	86.5 (365)	80.8 (42)	85.7 (18)	1.41	2
Financial stability	71.5 (301)	92.3 (48)	100.0 (21)	18.0**	2
Positive outlook	65.5 (276)	25.0 (13)	19.0 (4)	46.1**	2
Healthy diet	55.0 (231)	55.8 (29)	66.7 (14)	1.10	2
Close friends/family	53.1 (223)	65.4 (34)	61.9 (13)	3.27	2
Physical exercise	39.8 (168)	44.2 (23)	47.6 (10)	.82	2

Good genes	31.6 (133)	30.8 (16)	38.1 (8)	.42	2
Mental activities	32.6 (137)	17.3 (9)	9.5 (2)	9.56**	2
Fulfilling marital/ significant relationships	26.7 (112)	51.9 (27)	28.6 (6)	14.1**	2
Adapting well to change	24.2 (192)	32.7 (17)	19.0 (4)	2.18	2
Work satisfaction	23.1 (97)	3.8 (2)	19.0 (4)	10.4**	2
Most influential factor on successful ageing for me is				93.2**	10
Physical health	53.1(223)	36.5(19)	33.3(7)		
Financial stability	7.1(30)	5.8(3)	42.9(9)		
Positive outlook	9.0(38)	0.0(0)	0.0(0)		
Close friends/ family	6.7(28)	15.4(8)	9.5(2)		
Healthy diet	6.7(28)	7.7(4)	4.8(1)		
Fulfilling marital/ significant relationships	3.6(15)	26.9(14)	9.5(2)		
Adapting well to change	3.6(15)	3.8(2)	0.0(0)		
Good genes	3.3(14)	0.0(0)	0.0(0)		
Physical exercise	2.9(12)	3.8(2)	0.0(0)		
Mental activities	2.4(10)	0.0(0)	0.0(0)		
Work satisfaction	1.7(7)	0.0(0)	0.0(0)		

Test: Pearson chi-square tests of significance for dichotomous variables and analysis of variance (ANOVA) for continuous variable.
Feel discriminated by age: "Within the past 30 days, have you felt emotionally upset as a result of how you were treated based on your age?" (Yes/No)
Value quality of life: "I want to preserve a good quality of life even if I may not live as long"(Yes/No)
To what extent you think about death? (1=Never to 10=All the time)
To what extent you fear death? (1=Not at all to 10=Very much)
Religiosity/spirituality: 5-items, summed scores from 0-25 with higher scores indicating greater engagement,
Self-rated general health : "In general, would you say your health is"(1=poor to 5=excellent)
Self-rated mental health : "Comparing yourself with people of your own age, would you say your mental health is" (1=poor to 5=excellent)
Limitations in physical functioning activities: Four-items from the physical functioning domain from SF-36 (4=Yes, limited a lot to 12=No, not limited at all)
Overall satisfaction with life (SWLS; The Satisfaction with Life Scale): Scores ranged from 5 to 25, with higher scores indicating greater satisfaction
Satisfaction with relationships with others: "In general, how satisfied are you with your relationships with friends and relatives" (1=Not at all satisfied to 10=Very satisfied)
Satisfaction with finances: "In general, how satisfied are you with your finances?" (1= Not at all satisfied to 10=Very satisfied)
Self-rated successful ageing:The self-rated single-item scale of global successful ageing(1=least successful to 10=Most successful):
**p=≤.01; *p=≤.05

Table 15. Significant predictors of successful ageing from stepwise selection models in whole sample, and among Malays and Chinese (Indians omitted because of small sample)

Significant predictors	Beta(95% CI)	t-test	df	R^2	F test	df
Whole sample				.33	43.9**	4, 457
Overall satisfaction with life	.23(.04,.09)	4.66**	1			
Self-rated general health	.20(.28,.68)	4.72**	1			
Satisfaction with finances	.21(.10,.26)	4.36**	1			
Religious/spirituality engagement	.15(.01,.04)	3.82**	1			
Women				.36	38.2**	4, 272
Overall satisfaction with life	.27 (.04,.10)	4.40**	1			
Self-rated general health	.23 (.30, .81)	4.30**	1			
Satisfaction with finances	.23 (.09, .30)	3.72**	1			
Religious/spirituality engagement	.27 (.01. .05)	3.44**	1			
Men				.28	22.8**	2, 177
Overall satisfaction with life	.34 (.02, .11)	5.14**	1			
Mental health functioning level	.22 (.24, .94)	3.31**	1			
Malays				.42	17.7**	2, 49
Satisfaction with relationships	.54 (.36, .91)	4.68**	1			
Self-rated general health	.24 (.02, 1.30)	2.08*	1			
Chinese				.33	38.5**	4, 400
Satisfaction with life	.23 (.04,.10)	4.33**	1			
Self-rated general health	.19 (.26, .67)	4.56**	1			
Satisfaction with finances	.21 (.10, .27)	4.16**	1			
Religious/spirituality engagement	.15 (.01, .05)	3.56**	1			

Test: Stepwise linear multiple regression analyses, with final models shown
(Variables entered: To what extent you think about death (1-10); To what extent do you fear death (1-10); Religiosity/spirituality engagement (0-25); Self-rated health (1-5); Number of chronic illness; Self-rated mental health (1-5); Limitations in physical functioning activities (4-12); Overall satisfaction with life (SWLS: 5-25); Satisfaction with relationships (1-10); and Satisfaction with finances (1-10).

6.1 Discussion

The aim of study III was to examine gender and ethnic differences in subjective ratings on the self-rated single-item scale of global successful ageing and in relation to variables associated with successful ageing: ageing perceptions; mortality salience and spirituality; health status; and life satisfaction.   Because perceptions of successful ageing are influenced by socio-cultural variations, it is important to examine gender and ethnic differences on these variables, which were previously reported to be associated with successful ageing[2,24].

As predicted that perceptions of successful ageing is subjected to cultural influences, I found ethnic and gender differences on subjective ratings of successful ageing, as well as on variables associated with successful ageing. It is not surprising that gender and ethic differences were found because although few studies specifically examined socio-cultural influences, gender and race have been reported to be correlates of successful ageing[24,148,28].

From the subjective ratings on the self-rated single-item scale of global successful ageing, I found that Malay participants considered themselves to be ageing more successfully as compared to Chinese and Indian participants. This is in contrast with a large cross-sectional study that examined successful ageing with older Malaysian Chinese, Malay and Indian participants[148]. They examined successful ageing using a multidimensional model (avoidance of chronic disease and physical functioning difficulty, and maintenance of good psycho-cognitive functioning) and reported that Chinese older adults were more likely to age successfully as compared to other races.   The different

impact of ethnicity on successful ageing may be explained by the different measurements used in both studies. It may be that the multidimensional model used was overly restrictive and does not capture subjective perspectives of older Malaysian adults themselves. In contrast, the self-rated scale of global successful ageing used in this study allowed participants to rate themselves, therefore capturing subjective perspectives from respondents.

In addition, I also found different sets of correlates depending on race and ethnicity, which attest to the importance of incorporating cultural dimensions when examining the concept, construct, prevalence and measurements of successful ageing. Empirical evidence has shown that correlates of successful ageing varied widely, which probably resulted from socio-cultural variations[2,24]. Limited cross-cultural research on successful ageing supports the importance of socio-cultural dimensions as successful ageing was demonstrated to be susceptible to cultural influences[84,35].

An interesting pattern was noted from my findings. Comparisons of ethnic differences revealed that Malay participants rated themselves highest on successful ageing despite reporting being most limited in performing physical functioning and being diagnosed with more chronic diseases and illnesses. Malay participants also reported engaging in more religious/spiritual activities, experiencing higher levels of overall life satisfaction as well as greater satisfaction with social and familial relationships as compared to other ethnicities.

A similar trend was also observed from my findings on gender differences. Similar to Malay participants, women rated themselves higher on successful

ageing despite facing more limitations in performing physical functioning activities. Female participants reported greater satisfaction with relationships and financial status, and were also more engaged with religious/spiritual activities. This particular trend of observations from these findings is in concordance with existing literature that firmly supports the importance of psychological and social functioning factors in ageing well[2,25].

Our findings suggest that relationships between successful ageing and health may be moderated by social support/relationships with friends and family, financial satisfaction and religion. Such psychosocial factors can act as buffers and compensates for the negative consequences of ill health, resulting in the enhancement of overall life satisfaction and well-being. Such psychosocial factors such as having good relationships with family friends and having financial stability were previously reported to be important factors for successful ageing in research conducted with Taiwanese and Malaysian older adults [84,34].

Malay and female participants who were more engaged in religious activities rated themselves higher on successful ageing. Similarly, I also found associations of religiosity/spirituality from findings previously reported in studies I and II. The positive influence of religion or spirituality on successful ageing was also reported by other studies[33,188]. For example, Taiwanese Chinese[84] and Malaysian Malays[34] expressed religiosity/spirituality as an important factor for successful ageing. Because religious beliefs and values can provide a meaningful thread of integration which enhances their adjustment to old age[33], it is potentially an important tool in aiding seniors in accepting and adapting to changes that comes with increasing age.

Although these findings supported the importance of psycho-social factors in successful ageing and its potential compensatory effects on ill health, this does not imply that health dimensions which were included in most multidimensional models are not important. Contrary to previous qualitative findings examining subjective perceptions of successful ageing with Western populations reported that older adults considered psychosocial factors to be more important than biomedical factors[25], majority of our participants voted physical health as the most influential factor for successful ageing. Similar to our findings, Taiwanese older adults considered health and independence to be most important for successful ageing. Therefore, the distinctive nuances and emphases given to the various factors by different ethnic groups attest to the need to understand and define the construct of successful ageing within cultural.

Findings from this study also suggest that rather than using researcher-criteria from multi-dimensional models in measuring successful ageing, the self-rated single-item scale of global successful ageing appeared be a better tool in measuring successful ageing. Unlike multi-dimensional measures, because the self-rated single-item scale of global successful ageing lies on a continuum, it is not restrictive and would allow participants to rate themselves as ageing successfully despite having health problems. The biomedical criteria present in most multi-dimensional models potentially exclude these participants with health problems and yet considered themselves to be ageing successfully.

This study has limitations. First, although the purpose of this study was to examine gender and ethnic difference, the sample size for Malay and Indian participants are relatively small, therefore, findings should be interpreted with

caution. The reason for the non-equivalent sample sizes for different ethnicities is related to the study design (this was the best method that was available due to time and financial limitations faced when collecting data for this thesis). Participants enrolled in this study were recruited from a cohort study and therefore the proportion of ethnicity depends on the racial proportion of the individuals living in the recruited area (study participants were recruited through door-to-door census). Further studies with more Malay and Indian participants could reach an adequate power to provide firmer evidence. Second, as a cross-sectional study design, this study does not provide any information on causal inferences and all measures were based on self-reports.   Prospective longitudinal studies to monitor the relationship of subjective ratings and test variables will be more informative. Qualitative studies should also be done to further clarify older adults' views of successful ageing.

Despite these limitations, I believe that this study offers valuable cross-cultural information on successful ageing in Singapore. It provides a look at successful ageing for a group of community dwelling older Chinese, Malay and Indian older adults. This investigation provided insights on gender and ethnic-based differences on perceptions towards successful ageing, which have not been previously examined. The other main strengths of this study include the use of a large, community-based sample, providing a range of socioeconomic characteristics of older residents in Singapore and the use of a multiplicity of measures.

Both gender and ethnic-based differences were found in this study. Female and Malay participants rated themselves to be ageing more successfully

despite facing more limitations in performing physical functioning activities. Although health was voted as most influential for successful ageing, psycho-social factors such as positive outlook, having close friends and family were reported to be important as well. This study also demonstrated the sensitivity and broadness of the self-rated single-item scale of global successful ageing as respondents were allowed to rate themselves as ageing successfully despite poorer physical functioning abilities. Depending on race and ethnicity, different sets of predictors for successful ageing were found. This demonstrated the subjective nature and importance of understanding successful ageing within the socio-cultural environment it occurs in.

Next, focus group discussions were conducted to further explore and understand older adults' subjective perceptions of successful ageing.

CHAPTER 7

RESULTS & DISCUSSION: Study IV

This study reports findings from study IV. The objective was to further explore and understand the perceptions of successful ageing for Singaporean Chinese, Malay and Indian older adults aged 65 and above, on what factors they think are important for successful ageing in focus group discussions.

7.1 Results

Demographics

Socio-demographic characteristics are shown in **Table 16**. There were 46 participants, with 21 men and 25 women. Age of participants ranged from 65-90. Four focus groups were conducted with Chinese (*n*=22) participants with mean age of 74 (*SD*=6.7); two focus groups were conducted with Malay (*n*=14) with mean age of 69 (*SD*=3.5) and Indian (*n*=10) with mean age of 70 (*SD*=3.5) participants respectively. Most were currently married (59%), and almost all reported having a religion (98%). About half received more than six years of education (52%) and 22% of participants were living alone.

Perceptions of successful ageing

From the transcripts, a total of 683 sentences were coded. From the analyses of the transcripts, coded sentences were grouped according to factors which were further condensed into broad themes/dimensions in terms of physical and cognitive well-being; having satisfactory family relations; meaningful social engagement and network; positive adaptation and emotional wellness; positive spirituality; and sufficient financial resources and autonomy **(Figure 4)**.

These six dimensions emerged through the use of constant comparison to identify similar and different factors. Across these broad themes, participants from different ethnic backgrounds shared both culture-universal themes and culture-specific themes. The dimensions, factors and examples are shown in **Table 17.**

(1) Physical and cognitive well-being

A major theme that emerged from the present study was that physical health and function was seen as a very important factor for successful ageing. Factors mentioned under this dimension included physical mobility and function (able to walk, no pain in the legs), positive health behaviours (healthy diet, regular health checks, adherence to doctor's instructions, regular exercises) and being cognitively intact (keep mind active, no depression or dementia). In particular, the mobility and pain-free movements were paramount to many participants because it affected participants' ability in taking care of themselves and the belief that ill-health would create dependency that would be a burden to their family, so that they would be able to go out of the house and participate in activities. Health was frequently referred as the ability to ambulate independently without assistance and majority of participants were quick to say that health was the most basic yet important contributing factor to successful ageing. Participants felt it was important to maintain physical and mental fitness by living an active and proper lifestyle through monitoring their diet, joining activities, attending health talks and exercise regularly.

"It's pointless if you can live to 100 years old but you can only lie on the bed and unable to walk." (Chinese, Female)

"Now that we are old, our health is the most important. Because a lot illnesses comes with ageing and life can be very hard. Because you are suffering from illness and walking is a problem. Plus, you frequently fall sick and suffer from pain all over, and living this way will affect you. That's why when we become old, being healthy is the best. (Chinese, Male)

"I guess when you take the health away, it's almost like the game is over . . . I think now the consciousness is if you don't take care of your health, you can talk about every other things, but it's like the game is over. My friends and I also talked about this and now we go for exercises together regularly, to fitness centers, cycling, swimming, all kinds of things. Of course we also take care about the medicines and taking the correct medicines." (Indian, Male)

There were fewer discussions on cognitive well-being in comparison to physical health. Cognitive well-being was expressed as having intact memory and ability to think (no dementia).

"Yes, the brain also. The brain must be good, can thinking all, how to do this and that." (Malay, Female)

Although the importance of physical health was highlighted for all groups, ethnic-specific elements were noticed during the group discussions among Malay participants. Physical health and cognitive well-being was linked to religion for some Malay participants. Regular religious activities that included specific prayer positions and recitations of the Koran had direct health benefits

and improved physical and cognitive health by helping with blood circulation and keeping minds alert.

"So in fact I read this one article, he's a Muslim Chinese but he's an expert in reflexology. Very interesting, he studied the way we sit during our prayers, every acupuncture point on our leg is in effect so that helps us in our blood circulation." (Malay, Male)

"Because of the recitation of the Koran itself helps, you have to memorize certain quotations. As you know, reading will enhance your brain function . . . so with recitation, with reading of books, you enhance your brain cells and functions. So that is probably why the dementia rate for Muslim Malays is not so high." (Malay, Female)

(2) Harmonious family relations

The second theme to emerge from this research was the importance of having a harmonious and happy family as evidenced by the frequency of comments and discussions throughout the transcripts. In order to be happy in old age, it was important to have a spouse who is supportive and to spend quality time together with children, grandchildren and other family members. Majority of participants associated acts of filial piety with their quality of life in old age. Simple acts of concern and respect such as receiving regular calls and visits from one's children constituted significant acts of filial piety makes them happy. Furthermore, children's well-being had direct impact on whether participants regarded themselves to be ageing successfully or not. For example, participants frequently mentioned that they will only be happy when they know that their children have successful careers and blissful marriages.

"When they are happy, we are happy." (Chinese, Male)

"The point is, money is not important to me, what's most important is knowing my children are happy. I have 3 sons, knowing that they have happy and fulfilling families, without financial problems makes me very happy. I will be happy like that，I must think of them. If my children and grandchildren lead good and fortunate lives, I will be happy. Money, to say frankly is a material thing, you come to the world without it and you can't bring it when you leave the world. But to me, my sons and their families are very important for me. I am happy when their families have no financial problems and have fulfilling and happy relations." (Chinese, Male)

Majority of participants expressed the importance of close family ties as important for ageing well. Some expressed the desire to live together or in close proximity with their children and most expected some form of monetary and emotional support from their children throughout old age. Examples included paying for their medical bills and regular visits from children.

"The most important thing is that my grandchild continues to give me money and to call me sometimes for me to hear his/her voice and that makes me happy."(Chinese, Female)

"The joy is there and you know my son is around me, my child is around me." (Indian, Male)

"For me, a little bit of money is enough. I don't need a lot. When I need $1000+ for eye surgery, they paid for me. When it's necessary, they will take care for me. Don't need to worry." (Chinese, Female)

Ethnic-specific elements were found for Chinese and Malay participants respectively. Several Chinese participants emphasized on the importance of having blood-related descendants and the knowledge of having grandchildren was closely associated with being happy, fortunate and successful in old age.

"For old people, descendants are the most important." (Chinese, Female)

"For me myself, I'm not very fortunate compared to everyone here. I keep hearing people say that they have children and grandchildren. My 2 sons are in their forties and unmarried. I feel a bit heavy in the heart when I hear that they all have descendants." (Chinese, Male)

"We are Chinese. We must find a daughter-in-law to bear children for the next generation. Will be happy like that." (Chinese, Female)

For most Malay participants, close family ties was regarded to be very valuable and children are considered as blessings from God. Disrespectful acts towards parents are forbidden by the religion and children are obliged to look after one's ageing parents.

"That's how we believe; every child brings that providence from god to you." (Malay, Female)

"It's your duty to take care of your elderly parents. Children are also not allowed to disrespect their parents, it's a sin." (Malay, Female)

(3) Meaningful social engagement and network

Majority of participants considered having genuine friends and being able to engage in meaningful activities to be important for ageing well. The presence of trustworthy and supportive friends as companions was particularly

important in the absence of family in reducing feelings of loneliness. In times of troubles, participants also shared their problems with friends. Interacting with friends and engaging in activities embraced the notion of human contact and the absence of loneliness

"Many friends to visit us and then we will be happy. Friends are important and we see them visit us, we happy lah." (Malay, Female)

Engaging in activities was mentioned by many participants as important for well-being and there was an emphasis on the need to participate in enjoyable or meaningful activities. Through these engagements, participants were able to spend time in doing things they like and at the same time derive a sense of accomplishment or fulfilment. Value was placed on engaging in meaningful or affirmative activities such as imparting life skills to others or giving back to society. Participants derived a sense of pleasure from mentoring others or sharing their wisdom and expertise. Some participants engage in charity or volunteer work as a way of receiving good karma. Activities mentioned included playing mah-jong, chatting on the phone, cooking, travelling, volunteering, visiting friends, volunteering, doing charity work, cooking, religious activities and singing. .

"I think so long as you are happy doing what you are doing, it doesn't matter whether you are doing volunteering work or shopping. So long as you enjoy."
(Chinese, Female)

"Mentoring, suddenly they realized there are so many things they don't know so we meet for lunch and they pick your mind you know. They ask you for recommendations and advice and I gave them a lecture straightaway for free.

So, mentoring is very valuable. I feel that at this stage of my place, the pleasure I'm getting is that I interact with my contemporaries and I'm interacting with people 10 to 15 years my junior in my area as a teacher, counselor and I alert them to all kinds of things for their own progress you know. I empower them you see and the pleasure of knowing that they have been we call it blessed or privileged by my wisdom or learning or understanding or expertise. We become friends." (Indian, Male)

Engaging in activities was also expressed as important for Malay participants; however concerns were raised in that such activities should be appropriate and allowed by the teachings of their religion, such as cooking or tai-chi classes. Activities such as line-dancing were deemed as inappropriate.

"… some of the Muslims do join cooking classes, that's okay, language classes. We do join but things like social dancing, line dancing we don't quite agree to all these activities so that's the difference." (Malay, Male)

"I think because these folks have the time as they are retired and like to socialize so this is one area I think I have no problem with. But among the Muslims, this is a no-no (line-dancing) because they have these social barriers." (Malay, Female)

Some Chinese and Indian participants considered having a job to be important for them in old age, even though most of them were unable to find employment. According to these participants, the opportunity to continue working enabled them to spend their outside of the house and feel useful at the same time. Having a job allowed them to practice their skills and also earned extra money at the same time.

"Actually to get the money and then some more I don't want my experience to go into the drain like that. I enjoy because first I got money and secondly don't forget what I have learnt before these things so carry on like that, I love it, yes and I get extra money as well, I can go holiday." (Indian, Male)

"Working can help to pass time. It's easier for time to pass by." (Chinese, Female)

(4) Positive adaptation and emotional wellness

The fourth theme to emerge related to the participants' emphasis on accepting and adapting to one's current situation while maintaining a positive outlook. Majority of participants expressed these attitudes as crucial for them to adjust well to the ageing process. Participants spoke of living one's life one day at a time with optimism and being "young at heart". The result is having freedom from worries and the ability to stop fretting about the things out of one's control and being happy with what life has given you. Participants often described the importance of having "peace of mind", being content with what you have and letting go of unhappy things. Participants achieved "peace of mind" by disengaging from negative things as well as using religion as a source of comfort.

"Humans age, there's nothing you can do, nothing will change. But seniors think about it differently. If we have the correct way of mindset, we can still be considered strong even after 60 years old and above. It can be considered as our 'golden age'. It's the truth, the 'golden age' and be happy. We can do something to help ourselves, such as helping out with house chores, doing dishes, sweeping floor, wiping tables and exercise." (Chinese, Male)

"I feel that as we aged, even though we are older in age, the important thing is that we should always feel young at heart. We must have a young heart"

(Chinese, Female)

"That's when the psychological things come in. Learning to accept you can never change the past." (Indian, Male)

"You think all the negative thoughts, I was this and that, and this will affect your mental. You are only brooding and you are only killing yourself."

(Indian, Male)

Having the desire to continue learning new skills in old age was also mentioned as important. Some participants expressed the need to adapt to the ageing process and continued to find new skills to learn. Learning new skills occupied their time and allowed them to find joy in doing new things.

"I feel that as we aged, even though we are older in age, the important thing is that we should always feel young at heart. We must have a young heart. After retirement, you feel you want to enjoy life, we have time for enjoyment. But after enjoying for a few years, if you have that you do not feel young at heart, you have to look for things to learn, to continue learning, regardless of what it is that you want to learn. There are many activities for seniors to participate in now. But many seniors feel that they are old, so they do not dare to participate in such activities." (Chinese, Female)

"Computers are very common now, I learnt some computer skills when I worked previously but due to retirement I forgot the skills. So now, I am

pushing and motivating myself to pick them up by joining computer courses."

(Chinese, Female)

Emotional wellness was included under this dimension and referred to the feelings of being cared for and loved by others. Participants expressed the need of being wanted by others and feeling useful. The avoidance of feeling lonely was emphasized by majority of participant. The feeling of being attached to someone is necessary for them to age well.

"But at this point, I feel that what is most important to me besides family and family bonding with children around you and all that, but to really have someone care and love you deep inside the heart. They do the best for you at the point when you need help. I think that's the most important." (Chinese, Female)

"There's the issue that you need somebody to care for you and love you."

(Indian, Female)

(5) Religiosity / spirituality

The theme of religiosity / spirituality was important for most participants but was emphasized more during Malay focus group discussions. Spirituality was associated to religious practices such as prayers, preparation for death and spiritual guidance on the meaning of life. Having religious or spiritual attachment allowed participants to share their worries while receiving comfort and inner peace. Many participants turned to God for spiritual guidance when faced with problems that cannot solved or in times of needs such sicknesses. For some participants, religious or spiritual attachment appeared to become

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increasingly central to their lifestyle as a form of preparation for the end of their lives. Some prayed to be able to pass away without suffering and others used the remaining time to pray and repent for past mistakes.

"You feel that something is missing today so you go to the Temple and it gives us inner peace. And sometimes we go there because we have something working in our mind, worrying us, maybe my children, my health; I don't know why I'm feeling so uncomfortable. So when you go there, you sit down and when you pray you are talking the Lord, you are just communicating with him and yourself. So when you do that, you find that you are relieving yourself of all your worries. So we do that regularly. I see many old people going to the Churches, Temples and Mosques regularly. Why, because they want the inner peace, they want the peace. So if you go to the Church on Sundays, you see a lot of senior citizens." (Indian, Male)

"I think besides the mental and physical health, spiritual health is also quite important. Because at this point in time, we have to go and see our maker soon or later. So it's good to have some sort of spiritual support." (Chinese, Male)

In particular, the dimension of positive spirituality was identified as instrumental for Malay participants in coping and adapting to the ageing process. While Chinese and Indian participants mainly used religion as a source of comfort, support and guidance as described above, Malay participants regarded religion as essential to daily living in old age. Furthermore, for most Malay participants, religion or faith in God strongly influenced other themes expressed as important for ageing well. Through religion, Malay participants were able enhanced their physical and mental

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health though regular prayers, maintained strong family relationships through religious teachings and activities, given spiritual guidance on coping with age-related changes and preparation for death, and received opportunities to socialise with others through religious activities organised by the Mosques. Having strong belief and faith in God was instrumental for their successful ageing and the belief that everything is given by God.

"First thing you have to understand that the Muslim community psyche is completely different form the non-Muslims. If you are Muslim, once you reach the age of 40 or 40 plus, they are more inclined towards spiritual attainment. In other words, they are more inclined towards religion. Social aspects, not so much, even their social gathering normally would be maybe group religious recitation." (Malay, Male)

"Actually religion is for the total health, physical, mental, social and spiritual health." (Malay, Female)

"This is a complete cycle of health and well-being. So if you have all these, what is health to you and you know if every action you dedicate to the creator he'll make sure that you will be able to do it. If you sincerely do it, no point praying 5 times just to show my neighbour but my heart is against it, quietly I cursed him, no point. Not sincere, no sincerity." (Malay, Male)

(6) Sufficient financial resources and autonomy

The need to have sufficient financial resources also emerged as important in the present study. Although not emphasised much throughout the discussions, participants expressed this theme as a basic necessity because everything requires money. For example, money is needed for medical care which is

expensive, to obtain food and shelter and buy treats for grandchildren. Related factors under this theme was being free from financial burdens during old age, saving and planning early for retirement, careful planning of expenses. Most participants acknowledged obtaining some form of financial support from their children. However, it was emphasized that there was no need to have a lot of money; rather they just need enough to provide them with the basic needs.

"How can you survive without money? There are no free things in reality, no free lunch." (Chinese, Male)

"And of course hopefully at that time you have secured your own house and you are free from other financial obligation. That is very important because at that stage, you are either working on a part-time basis or you are not working. So you must have the resources to carry on a comfortable life, not necessary a lavish life but a comfortable life. If you need money to spend, you have the money. Money is important, not say money is not important."

(Chinese, Male)

"I must comment on the money things. It's not like we want to be multi-million dollar, I just want enough money to do my things, go for a concert, go for a film, go to the food center and now and then go eat at a nicer place. That's all. . . We want to have own money. So there must be sufficient to last. We are living longer and longer for about 20 years, we must have enough to last that long." (Indian, Male)

Related to this theme was autonomy which was briefly discussed as important in some Chinese and Indian focus group discussions. Having sufficient financial resources enabled participants to be independent and have the

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freedom in doing what they want to do and going where they want to go. The
ability to do whatever they like was also related to the notion that the children
do not require looking after anymore and thus participants were able to do
things they were not able to previously.

"I can go anywhere I want, eat whatever I like and buy whatever I want."

(Chinese, Female)

*"My sons are all big now, I have 2 sons and 2 daughters and they are all
married. This is freedom since they don't need me to worry or look after them
anymore." (Chinese, Male)*

World peace

World peace was a factor that was not combined into any of the six themes. It
was listed by one Chinese participant as one of the contributing factor towards
successful ageing. This participant specifically mentioned it was important for
her to live in a peaceful environment without outbreaks of wars.

*"I also wish for world peace. World peace is most important. If there is no
peace, it's very difficult and troublesome as there will be wars all the time."*

(Chinese, Female)

Factors voted to be most important for successful ageing

Participants were asked to vote for the most important contributing factor in
successful ageing discussed during each of the focus groups, results are shown
in **Table 18**. Five factors were identified and they were: health; religion;
money; freedom; and helping others. Health had the most votes, followed by
religion, money, freedom and helping others respectively. All but one Chinese

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participant voted health to be the most important factor. Health was also voted

to be the most important factor for half of the Indian participants. More than

half of the Malay participants voted religion to be the most important factor.

Table 16. Focus group demographic characteristics [*N*=46]

		Chinese (*n*=22)	Malay (*n*=14)	Indian (*n*=10)	Total
Focus groups	Number	4	2	2	
Gender	Male	9	4	8	21
	Female	13	10	2	25
Age	Mean	73.8	68.7	70.2	
	(*sd*)	(6.7)	(3.5)	(3.5)	
	Range	65-90	65-75	65-75	
Monthly income	Less than $500	20	5	9	34
(current, monthly)	More than $500	2	9	1	12
Marital Status	Single	6	0	0	6
	Married	11	10	6	27
	Divorced	2	1	1	4
	Widowed	3	3	3	9
Religion	Yes	21	14	10	45
	No	1	0	0	1
Education	Nil – Primary	13	5	4	22
	Secondary & above	9	9	6	24
Living Arrangement	Alone	8	1	1	10
	With family	9	13	9	31
	With others	5	0	0	4

Test: Descriptive statistics.

Table 17. Multidimensional lay model of successful ageing

Dimension	Factors and examples from current study
Physical and cognitive well-being	**Physical mobility and function**: "able to walk"; "no pain in the legs"; "no need to be in a wheelchair"; etc. **Positive health behaviours**: "have to monitor your diet"; "go for check-ups at least once a year"; follow proper instructions for medications"; "good to have some exercises"; etc. **Cognitive health:** "keep mind active by playing mahjong"; "no depression or dementia"; etc.
Satisfactory family relations	**Filial piety**: "frequent visits from children"; "Happy receiving calls"; "financial support from children"; "care and concern from own blood"; "strong family ties"; "sin to disrespect or not take care of parents"; etc. **Children and grandchildren**: "happy knowing children have own career and family"; "children are financially okay and happy"; "children all married"; "have grandchildren to play with"; "staying together with children"; etc.
Meaningful social engagement and network	**Friends**: "have supportive friends"; "have good neighbours"; "share problems with friends"; "make new friends"; "happy talking to friends"; "interact with people of all ages"; etc. **Meaningful activities**: "singing karaoke brings happiness and make new friends"; "stay occupied with hobbies and activities you like"; "happy going to the senior activity centre"; "travel to other countries"; "only do things that makes you happy"; "must feel a sense of satisfaction from engaging in fulfilling activities"; "mentoring others"; "happy and satisfied from helping others"; "feel good and happy about volunteering"; "feel accomplished and peaceful for volunteering"; "giving back to society"; "feel joyful giving joy to others"; etc. **Socialise with others**: "remain engaged with others, important for mental health"; "interact with young people"; "socialise with others, don'ts stay at home"; "socialise with others then won't have many worries"; etc. **Work**: "to pass time"; "to save money"; "buy things you like"; "no reason to stay home and do nothing"; "practice skills"; "a form of exercise"; "feel useless when stop working"; etc.
Positive adaptation and emotional wellness	**Adopt correct attitude/positive mind-set**: "take one day at a time"; "adopt correct way of thinking"; "young at heart"; "don't think too much"; "worry will grow old"; be happy everyday"; "be contented / satisfied"; "letting go of things"; "don't stress"; "peace of mind"; "adapt to changes"; "give up when necessary, now your limits"; "be positive"; "learn to accept you can never change the past"; etc. **Learning new skills**: "young heart to learn"; "feel joy"; etc. **Emotional needs:** "not to be lonely"; "feeling of being cared and concerned by others"; feeling respected"; "feeling wanted / needed"; "feeling loved by others"; "feeling useful and satisfied"; etc.
Positive spirituality	**Prayers**: "mediate and pray to God for solution"; "happy to be praying"; "feel strong, gain confidence, peace of mind"; "free yourself from worldly matters during prayers"; "praying gives peace of mind"; "inner peace"; "comfort"; "relief of worries"; etc. **Health benefits**: "praying posture improves health"; "a form of Chinese acupuncture"; "praying position helps with blood flow"; "reciting the Koran helps train the brain"; etc.

	Preparation with death: "good to have spiritual support because can pass away anytime"; "know where I'm came from and where I'm going"; "time is coming"; "fear of death"; "go to a place of bliss after death"; "repent for forgiveness"; "day of judgment"; etc. **Spiritual guidance**: "the way to live"; "think according to religious teachings"; "meaning in life"; what life is about"; "you build your physical self through spiritual understanding"; "dedicate everything to the creator and he will help you with everything"; etc.
Sufficient financial resources and autonomy	**Sufficient financial support**: "financial support from children to buy things or for medical care"; "everything requires money"; "nothing is free"; "expensive healthcare"; "must have food to eat, place to sleep"; "buy treats for grandchildren"; "free from financial burden"; "plan early for retirement"; etc. **Autonomy**: "go wherever you want"; "no worries with raising children"; "have freedom to do what you want"; etc.

Note: Summary of factors and examples from the transcripts for each of the six dimensions of the multidimensional lay model of successful ageing.

[Phrases that are denoted by an open inverted comma are actual coded segments from the transcripts, which are then coded under respective factors (factors are bolded in the table). Finally, these factors are further condensed into 6 broad themes/dimensions as shown in the table. Please refer to **section 3.4.6** for more details.]

Table 18. Factors voted as most important for successful ageing for all participants and for each ethnicities

	Factors				
	Health	**Religion**	**Money**	**Freedom**	**Helping others**
Total (*N*=46)	63(29)	23.9 (11)	8.70 (4)	2.20 (1)	2.20 (1)
Chinese (*n*=22)	95.5 (21)	0 (0)	0 (0)	4.50 (1)	0 (0)
Malay (*n*=14)	21.4 (3)	64.3 (9)	14.3 (2)	0 (0)	0 (0)
Indian (*n*=10)	50 (5)	20.0 (2)	20.0 (2)	0 (0)	10.0 (1)

Values are in percentage (n)
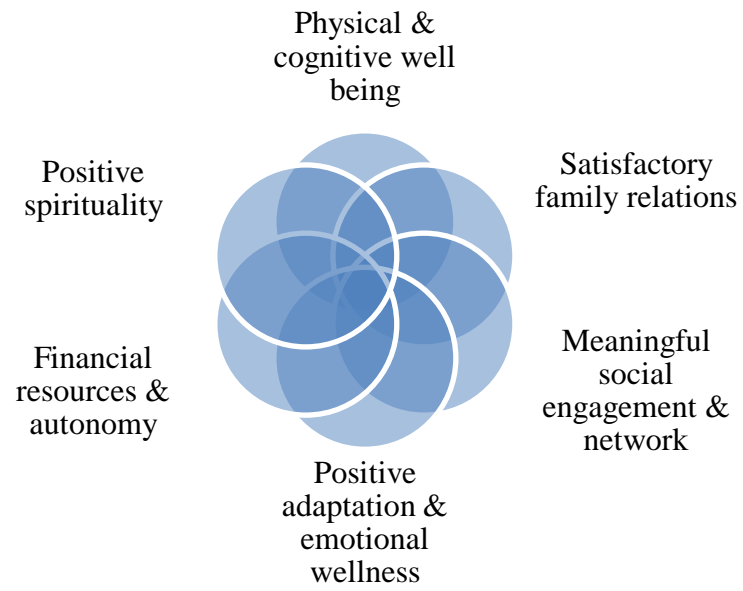
Figure 4. Lay model of successful ageing with six inter-related theme

7.2 Discussion

The aim of this present study was to explore the perceptions of successful ageing among Singaporean Chinese, Malay and Indian older adults though focus group discussions. Through interactive discussions, this methodology allowed participants to fully express their perceptions of successful ageing and such insights would not have be fully captured with quantitative methods. Findings indicated that the lay model of successful ageing for our participants involved six inter-related themes: physical and cognitive well-being; harmonious family relations; meaningful social engagement and network; positive adaptation and emotional wellness; positive spirituality; and sufficient financial resources and autonomy. Although all six themes were deemed as important for ageing successfully by participants, there were some differences on the degree of emphasis and meaning for the themes based on ethnic background.

Among the six themes, physical health appeared to be the most important component as evidenced by participants' knowledge and frequent comments on health factors such as regular exercises, healthy diet, having mobility, adherence to medical advice and knowledge on health-related issues. Compared to Malay participants, more Chinese and Indian participants voted health as most important for ageing successfully. Maintenance or improvement of health status was associated with religious practice for Malay participants. Our findings on the importance of health for successful ageing was contrary to qualitative studies whereby participants emphasised on psycho-social factors and little emphasis on health factors such as disease/disability, function and independence[25,26]. However, this finding was

in line with results from study III, whereby health was voted as the most influential factor on successful ageing.

This finding was consistent with larger quantitative studies of successful ageing [31,48,51,52,18]. Similarly, from a study exploring the concepts of successful ageing in older Taiwanese adults, 47.4% of participants subjectively expressed physical health as important and 76.7% rated it as first priority in ageing successfully[84]. The importance of health was related to the belief that ill-health would limit functional ability to social engagement, participate in activities. Another consequence of ill health was the fear of creating a dependency that would burden their family. All participants were community-dwelling individuals who lived either in public or private housing and this was different from the other two qualitative studies[25,26] which recruited participants mainly living in retirement communities, whereby a level of care and support will be provided if necessary. The emphasis on pain and physical health may also be a reflection of the common occurrence of arthritis and hip fracture with old age[145]. Losing control over one's body functions and experiencing pain was shown to diminish perceived quality of life in older adults[144].

The importance of a harmonious family and filial children is a factor unique to certain cultures and was not included in definitions of successful ageing. For Singaporean older adults, the cultural value of filial piety was a major topic of discussion. The importance of having supportive children and fulfilling family relations was stressed by all participants, regardless of ethnicities. Furthermore, participants expected a certain level of support, care and concern from their children in old age. This can be related to the traditional Confucian

value of filial piety, which emphasized dependency and family care for the aged as important for successful ageing. In fact, Malay participants regarded disrespect and not caring for one's aged parents to be a sin.

Traditional filial piety guides family relationships by emphasizing values such obedience, respect, emotional support and physical care to the elderly[189]. Even with changing family structures due to modernisation, Singaporean older adults maintained Confucian values of filial piety as important for successful ageing by stressing on the importance of strong family ties, intergenerational bonds and familial care. Previous studies have shown the impact of roles of children and family dynamics on ageing well[84]. For example, older adults in China who lived together with their children were found to have better psychological dispositions than those living alone[190]. Similarly, institutionalised older adults in China who lived in close proximity to children had increased feelings of loneliness compared to those who lived far away[189].

However, rather than demanding that their children take total responsibility for them, Singaporean older adults expressed an awareness for the need to be more independent. Although a basic requirement for emotional and financial support from children was expected, participants placed more emphasized on the importance of having a happy and harmonious family and the knowledge that their children are happy and living well. The knowledge of knowing they are loved by their family and having grandchildren were crucial to their successful ageing.

Religion was particularly essential to the well-being of Malay participants. The importance of religion for Malay participants was further evidenced as

nine out of 14 voted religion as the most important factor for successful ageing. Religious practices such performing the five-time daily prayers and regular visits to be mosque were seen as positive influences for their physical, cognitive, psychological, social and family well-being. Religious attachment improved their physical and mental health, engaged them in social activities, provided spiritual guidance, provided comfort and enhanced familial relations. The salient role of religion in Malays was documented by earlier studies [33,34]. Spirituality acting as a key resource for assisting participants to adapt and respond to the ageing process was also supported in other studies with Malays and Indians in Singapore[33,188].

Although religion was not the key component in successful ageing for Chinese and Indian participants in comparison to Malay participants, it was still regarded as important. Singaporean Chinese and Indian participants used religion as a source of comfort in times of need, for peace of mind, spiritual guidance and coping with mortality issues. Similarly, spiritual well-being was found to be essential for an ideal and satisfactory life for Taiwanese older adults[84]. The interconnected role of religion, spiritualty and ageing should be not ignored in future studies of successful ageing.

There was an emphasis on participating in not just any activities rather, it was important to participate in activities that were meaningful and fulfilling. Having good friends who were trustworthy and supportive was also stressed during discussions. The preference on participating in meaningful activities that makes them happy and satisfied can be explained by the socioemotional selectivity theory proposed by Carstensen[81]. According to this theory, as time shrink with age, older adults become increasingly selective by investing

more resources in emotionally meaningful goals and activities. Furthermore, older adults prefer spending more time with familiar persons with whom they have had rewarding relationships and this was also evidenced from this study. This selective narrowing of social interaction maximizes positive emotional experiences and minimizes emotional risk as individuals become older by systematically shaping social networks such that available social partners and activities satisfy their emotional needs[81].

Volunteering and charity works or similar meaningful activities were also correlated with physical and psychological well-being[191,192]. Engaging is such meaningful activities may contribute to successful ageing by reinforcing satisfaction for what one has rather than dissatisfaction for what she lacks and shift the salient group upon which people evaluate their circumstances from those who are above them in the income distribution to those who are below them[191]. Furthermore, the social role hypothesis explains the link between volunteering and health and happiness by the fact that volunteering is an activity that is valued by society and, therefore, people engaged in volunteer labour feel useful and as a consequence report higher happiness and better health status[193]. Engaging in charity work was also related to religious beliefs as some participants believed that they were able to accumulate good karma.

Participants also spoke about the importance of looking at ageing positively and being flexible and adaptive to changes. Positive attitudes such as being optimistic, don't worry, accepting of changes, and willingness to learn new things were seen as essential for their adjustment to the ageing process. Studies exploring subjective perceptions of successful ageing often reported

psychological factors such as adaptation and acceptance, emotional well-being as important factors for ageing well[28,25,26,18]. The importance of accepting and finding new strategies to cope with age-related changes can be explained by the theory of selective optimization with compensation by Baltes and Baltes[83].

Concern for financial security may be related to the fact that more than 70% of study participants reported having an income of less than S$500 per month (from work, pension or from children). Furthermore, participants mentioned the importance of being more independent and less reliant on children. World peace was mentioned by one participant to be important for her and this may be explained by the instability experienced during the occurrence of World War II and founding years of Singapore

There are several limitations this study. First, there were lower proportions of Malay and Indian participants due the difficulties encountered in recruiting enough English-speaking Malay and Indian seniors aged 65 and above. Furthermore, due to time and other constraints, the sample size was relatively small [initial plan was to stop recruitment when data saturation has reached, such that additional focus group discussions would not reveal new information]. Second, participants were relatively healthy volunteers recruited through convenience sampling methods and there results may be biased and non-representative of the broader population, especially when only English-speaking Malays and Indians were eligible. Furthermore, Chinese older adults who speak only dialects were also excluded. Second, only minimal demographic information was collected and therefore there may be unknown/unmeasured factors that may have contributed to the findings.

Therefore, interpretation of data should be made with caution and should not be inferred outside of study populations. Thirdly, participants were asked to reflect and recall, therefore recall bias may occur.

There is currently little or no research examining successful ageing in Singapore, therefore although largely exploratory in nature, findings from this study contribute valuable insights on perceptions of successful ageing among older Chinese, Malay and Indian Singaporeans.

This study found that although physical health was the main focus of concern for old age in Singapore, continued social engagement, psychological adaptation were important contributing factors for ageing successful. Culture-specific components relating to family relationships, religion / spirituality and financial security were also emphasized by older Singaporean adults. The lay construct of successful ageing for Singaporean older adults do not completely match the objective indicators typically used in Western societies as evidenced by the continuing existence of culture-specific values and attitudes among Singaporean older adults. Therefore, it is crucial that researchers define and measure successful ageing within particular cultural and temporal contexts[84]. In conclusion, this study provided valuable insights of the values and attitudes among Singaporean older Chinese, Malay and Indian adults, and the ways in which they differ from other cultures. We found that the lay concept of successful ageing involved optimal functioning in multiple areas. Although all six themes were important for successful ageing, participants placed different degrees of emphasis and meaning depending on ethnic backgrounds. The multidimensionality of the lay concept of successful ageing involved six inter-related themes: physical and cognitive well-being; harmonious family

relations; meaningful social engagement and network; positive adaptation and emotional wellness; positive spirituality; and sufficient financial resources and autonomy.

CHAPTER 8

SUMMARY

In the series of studies (I, II, III, IV) presented in this thesis, the overall objective was to explore multidimensional and global models of successful ageing. Although both multidimensional and global models of successful ageing were validated, these findings suggest that the global model of successful ageing is better than multidimensional models. The self-rated single-item scale of global successful ageing not only incorporates subjective perceptions which are important, it also captures underlying dimensions and information that are otherwise not extracted with broader criterion-based multidimensional models, which are restricted by the components and measurements used. Because it lies on a continuum, the self-rated single-item scale of global successful ageing was sensitive to differences in opportunities to age successfully and cultural differences.

The notion of whether it is possible to fully tap the contents of successful ageing with a set of operational criteria/dimensions remains questionable. The multidimensional model used should incorporate subjective input, be culturally valid and appropriate for the local population. However, interpretation of the self-rated single-item scale of global successful ageing is limited. The ratings on the scale does not provide insights or additional information to why scores are low or high as there is no control over the areas respondents are actually assessing. Therefore, both multidimensional and global measurements can be used simultaneously and be complementary to each other. For example, the easily administered self-rated single-item scale

of global successful ageing can be used for population or identifying those in need of intervention while the criterion-based multidimensional model can be used for needs assessment interventions.

In study I, I demonstrated the concurrent and predictive validity of a broad multidimensional construct of successful ageing that consisted of four dimensions: physical health and well-functioning; cognitive and emotional well-functioning; high social functioning and active life engagement; high life satisfaction. Good convergent validity was found by its associations with concurrent health status and healthcare use parameter. Predictive validity was demonstrated as baseline successful ageing status was associated with better quality of life measured at baseline and two years later. In contrast to studies based on more restricted biomedical definitions of successful aging that showed a preponderance of health-related determinants, my broad multi-dimensional construct identified more socio-demographic, psychosocial, and behaviour factors including nutrition and spirituality in a multidimensional construct of successful aging among Chinese elderly populations. The independent predictors of successful ageing were age, gender, better housing, religion, and nutrition. However, although the broad multidimensional model was validated, it was evident that the model remained restrictive as less than 30% of participants were classified as successful agers. Furthermore, less than half of our participants fulfilled the criteria of physical health and well-functioning.

For Study II, I demonstrated the reliability and validity of a self-rated single-item scale of global successful ageing in an elderly Singaporean population. The self-rated single-item scale of global successful ageing was correlated

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with specific dimensional models of successful ageing, thus showing construct validity. It was also able to predict outcome measures of life satisfaction and quality of life. Excellent test-retest reliability was also found. The self-rated single-item scale of global successful ageing was found to be independent of most correlates. This is consistent with the underlying notion that the holistic construct of global model of successful ageing transcends the limitations of demographic, socio-economic and health status. Therefore, with a global model and measurement of successful ageing, participants were able to rate themselves as ageing successfully regardless of their age, gender, or if they were poor or uneducated. A large proportion of the variance in self-rated single-item scale of successful ageing remains unaccounted for. This implies the scale reflects the subjective, sensitive evaluation by the respondents themselves and was able to capture implicit information that is otherwise not extracted with criterion-based multidimensional measures. This is in line with the suggestion that successful aging is a global construct that goes beyond objectively defined dimensions.

As no explicit multi-dimensional measure is likely to fully tap and measure all the possible domains, the empirical validation of a subjective global measure of successful ageing provides strong support for its use in measuring successful ageing as a holistic construct. Self-rating of successful ageing along a continuum is both a sensitive and comprehensive measure of successful ageing, capturing implicit information that is not readily extracted with explicit criteria-based measures. The use of a subjective self-rating scale is reflective of successful ageing as primarily a value judgment held by elderly respondents themselves. With strong psychometric validation, self-rated

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successful ageing derived from a simple global measurement tool may thus be recommended as a universally acceptable standard measurement of global successful ageing for use in comparative analyses

In Study III, I found gender and ethnic-based differences in subjective ratings on the self-rated single-item scale of global successful ageing and in relation to variables associated with successful ageing. Female and Malay participants rated themselves to be ageing more successfully despite facing more limitations in performing physical functioning activities. Although health was voted as most influential for successful ageing, psycho-social factors such as positive outlook, having close friends and family were reported to be important as well. This study also demonstrated the sensitivity and broadness of the self-rated single-item scale of global successful ageing as respondents were allowed to rate themselves as ageing successfully despite poorer physical functioning abilities. Depending on race and ethnicity, different sets of predictors for successful ageing were found. This demonstrated the subjective nature and importance of understanding successful ageing within the socio-cultural environment it occurs in.

In study IV, focus group discussions were conducted to further explore and understand older adults' subjective perceptions of successful ageing. Although physical health was the main focus of concern, participants also mentioned psychosocial factors to be important for ageing successfully. This finding was in line with results previously reported in study III, whereby health was voted as the most influential factors in successful ageing. Cultural-specific factors relating to family relationship (having descendants, filial piety) and religiosity/spirituality were found. Using data from this study, the lay

concept of successful ageing involved optimal functioning in multiple areas. Although all themes were important for successful ageing, participants placed different degrees of emphasis and meaning depending on ethnic backgrounds.

The multidimensionality of the lay concept of successful ageing involved six inter-related themes: physical and cognitive well-being; harmonious family relations; meaningful social engagement and network; positive adaptation and emotional wellness; positive spirituality; and sufficient financial resources and autonomy. This lay model of successful ageing do not completely match the objective indicators typically used in Western societies and was broader than the multidimensional models used in studies I and II. Although exploratory in nature, this study provided valuable insights to the perceptions of successful ageing among Singaporean Chinese, Malay and Indian older adults.

CONCLUSION

Given that there is currently no standard measurement of successful ageing and faced with the limitations of using criterion-based dimensional measures in measuring successful ageing; this thesis supports the use of a self-rated single-item scale of global successful ageing that is based a simple analogue scale. This scale may be recommended as a universally acceptable standard measurement of global successful ageing for use in population monitoring and comparative analyses. While criterion-based dimensional measures of successful ageing, given some practical limitations, remain potentially useful in programme intervention and evaluation for relevant outcomes.

Strengths and Limitations

A major strength of this research was the use of a mixed methodology approach. The use of both quantitative and qualitative methods allowed us to gain a deeper insight regarding successful ageing by capturing both objective and subjective perspectives. The participants of this research were a heterogeneous mix of older adults in terms of demographic factors, in contrast to most prior studies which involved Western or specific ethnicity.   Other strengths of the study include the use of large, population-based sample and the use of a multiplicity of measures. Currently, there is little or no research specifically examining the construct, correlates, prevalence or measurements of successful ageing among Singaporean older adults. Therefore, although largely exploratory in nature, findings from this thesis contributed valuable information on better understanding successful ageing in Singapore.

There are some limitations. Although based on standardised translated Chinese questionnaires, questionnaires was interpreted into different Chinese dialects (e.g., Hokkien, Teochew, Cantonese) by nurses when necessary and this may introduce subtle nuances in interpretation and response biases.

There were low proportions of Malay and Indian participants included in the studies. One reason was because participants from the SSOSA study were recruited through door-to-door census and I did not specifically target a minimum number of Malay or Indian participants to recruit. Secondly, due to language restriction, the focus group discussions were limited to Malay and Indian participants who were able to converse in the English language. This made it very difficult to recruit participants from these ethnic backgrounds as

majority of Malay and Indian individuals aged 65 and over could only converse in their native languages. There may also be selection bias due to this restriction. Furthermore, study samples only included non-institutionalised older adults. Therefore, findings should be interpreted with care. Exploring relationships between institutionalised older adults and successful ageing should also be considered for future studies.

Implications of Findings

Currently, there is no consensus on how successful ageing should be measured. Both multi-dimensional criteria based model of successful ageing and the self-analogue scale of successful ageing were validated in this thesis. Rather than comparing and contrasting how these two measurements differ in measuring successful ageing, we should regard them as complementary tools to each other. Both multi-dimensional criteria based model of successful ageing and self-rated analogue scale of successful ageing should be used simultaneously. For example, the easily administered subjective-based self-rating scale can be used for population monitoring and comparison purposes while the objectively-based multi-dimensional measurement can be used for needs assessment and intervention purposes.

Results from this research have important implications for interventions as they highlight modifiable risk factors such as health behaviours, environmental influences. "Prevention is better than cure", so rather than focusing on medical treatments, the identification of important behaviours and factors can increase the probability of ageing successfully for older adults. Therefore, it is important that identified modifiable risk factors and correlates of successful ageing be used by intervention or educational programmes in helping older adults to age successfully. In helping older adults to age successfully, the burden of care can be reduced as there will be less demand for healthcare or financial resources. Although it may be easier to implement programmes on health and function (e.g., engage in activities) attention should also be placed on psycho-social correlates such as helping older adults in building and maintaining good relationships with family, friends or others.

Presence of illness or disabilities is likely to increase with age, therefore, possession of certain psycho-social tools may compensate for these losses.

Furthermore, intervention programmes appropriated for targeted cultural group enhanced the effectiveness of the intervention and thus lead to better well-being. Intervention programmes that were previously shown to be effective for a population may not necessarily be appropriate or work for other populations. Therefore, care should be taken during planning of programmes to ensure that the programs are appropriate and relevant for the target population. For example, certain physical activities that require physical contact may not be appropriate for certain racial groups that restricts physical contract between genders. It is important to remember that there is no template for successful ageing as successful ageing is influenced by socio-cultural factors.

Overall, results from this research confirm the importance of defining the concept of successful ageing within cultural and temporal contexts through the use of both quantitative and qualitative methodologies. Although there are important factors for successful ageing that are universal, the presence of culture-specific factors should be noted.

Therefore, it is crucial to define and measure successful ageing within particular cultural and temporal contexts[84]. Importantly, these ethnic cultural differences should be taken into consideration in policy-making and in designing and offering programmes to seniors of different ethnic backgrounds in multi-racial Singapore.

Recommendation and Future Studies

1.   Further validation of the self-rating scale of global successful ageing should be conducted in other countries or populations that differ in cultural characteristics. This would further strengthen the validity and support for the self-rating scale of global successful ageing as a good measure of successful ageing.

2.   To further validate the scale, longitudinal studies for predictive validity of the self-rating scale of global successful ageing should be done.

3.   Small group studies can be conducted to examine the interpretation of the ratings on the self-rating scale of global successful ageing, by asking participants to rate on the scale and discuss on the meaning of their ratings.

4.   Due to time and research design of this thesis, the exploration of cultural/ethnic influences on successful ageing was limited. Further quantitative and qualitative studies of ethnic differences and cultural dimensions on successful ageing are desirable. As participants from this thesis were community-dwelling individuals, it also may be interesting to include non-community living older adults in future studies.

5.   Although my multidimensional model of successful ageing was validated, results indicated that the model remains restrictive. Future studies should further improve on building a better multidimensional model of successful ageing. The dimensions added and criteria or measurements used should be chosen by considering the lay perceptions of successful ageing. Inclusion of lay opinions on successful ageing ensures that the new multidimensional model is culturally relevant for the population.

6.   The lay model of successful ageing from the focus group discussions (study IV) can be used as a foundation and more qualitative research should be conducted to improve upon my lay model. Further studies should recruit participants from a broader population of older adults from various cultural backgrounds. Then, quantitative research should be done to operationalise and validate it as a multidimensional model for use in the local population.

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Determinants of Successful Aging Using a Multidimensional Definition Among Chinese Elderly in Singapore

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Objective: *Most studies of successful aging have used restricted definitions based on the absence of disability and identified a small number of predictors. The authors aimed to examine whether a broad multidimensional definition of successful aging has good construct validity and identified a wider range of predictors that are relevant for multifaceted interventions.* **Methods:** *Cross-sectional and longitudinal data analyses were performed on 1,281 community-living Chinese elderly of 65 years and above in the Singapore Longitudinal Aging Study cohort. Successful aging was measured in multiple dimensions of functioning and wellness: cognitive and affective status, physical health, social functioning and engagement and life satisfaction, and a summary composite measure created across dimensions to form a dichotomous variable. Potential determinants included sociodemographic, psychosocial, behavioral variables.* **Results:** *Successful aging was determined in 28.6% of respondents and in multivariate models was significantly (p <0.05) associated with age (OR = 0.90), female gender (OR = 1.37), ≥6 years of education (OR = 2.31), better housing (OR = 1.41), religious or spiritual beliefs (OR = 1.64), physical activities and exercise (OR = 1.90), and low or no nutritional risk (OR = 2.16).* **Conclusion:** *In contrast to findings based on more restricted biomedical definitions of successful aging, a multidimensional definition of successful aging identified more variables including demographic status, psychosocial support, spirituality, and nutrition as salient determinants.* (Am J Geriatr Psychiatry 2009; 17:407–416)

Key Words: Successful aging, active aging, healthy aging, spirituality, Asian, Chinese

Successful aging is of great interest to geriatric care and public health. A central focus of research is on better understanding and defining successful aging and identifying its predictors so that clinical care and preventive programs can be more meaningfully informed.

Early research has variously defined successful aging using narrowly defined single dimensional bio-

medical, psychological, or social functioning constructs.[1] In recent years, however, a multidimensional concept of successful aging is increasingly being recognized.[2–6] A multidimensional concept of successful aging is in line with the World Health Organization's definition of health as a state of complete physical, mental, social, and spiritual well-being. Thus, more than the mere absence of disease or infirmity, successful aging is being defined by all aspects of personal well-being including mental well-being, maintenance of an active life style, good supportive relationships, and life satisfaction.

In empirical research, the concept of successful aging is seldom defined or is only implied by choice of measures, and few models are truly multidimensional.[2] A majority of studies using restricted biomedical definitions of successful aging such as the absence of disability with few psychosocial variables[7,8] have most strongly identified younger age, nonsmoking, absence of disability, arthritis, and diabetes as significant correlates. Only moderate support was found for a positive relationship with physical activity, social contacts, self-rated health, absence of depression and cognitive impairment and number of medical conditions, and generally no relationships were found for gender, income, education, and marital status.[9] Of note, although psychosocial variables have received less research attention, they were clearly identified by elderly persons themselves as integral to successful aging.[10] Recent studies of Chinese elderly in Hong Kong and Shanghai,[11,12] which used multidimensional criteria of successful aging, have identified sociodemographic factors including younger age, male gender, education, currently married, financial well-being, and psychosocial factors and leisure activities as determinants of successful aging.

As it is, there is currently limited understanding of the full extent to which many different determinants of successful aging could be usefully identified for effective interventions. For example, resource and behavioral factors including nutrition are important in social and health interventions in the elderly, but few studies have explored them as primary determinants of successful aging.[13] Positive spirituality is regarded as integral to successful aging,[14] but it is a missing component in studies of successful aging.

Successful aging is likely to be influenced by culture. Given the cultural importance of family bonds and spirituality in Asian societies, psychosocial support is shaped by moral values, such as respect for old age and filial piety (a primary duty to respect and care for one's parents by every means that is only abrogated with shame). Hence, it is of great interest to explore successful aging in Asian seniors.

Successful aging may be conceptualized as a developmental and maintenance process in which age is associated with the attainment of at least optimal if not the highest possible physical, intellectual, emotional, social, vocational and spiritual functioning, and well-being that is consistent with normal aging. In this study, we aimed to demonstrate the concurrent and predictive validity of a multidimensional definition of successful aging in Chinese seniors in Singapore.

We operationally defined as successful aging seniors those who were in good or excellent self-reported health status, independent in instrumental activities of daily living, high level of cognitive functioning (Mini Mental State Examination, MMSE ≥ 26), having few depressive symptoms (Geriatric Depression Scale, GDS <5), were engaging in at least one social activities and in at least one productive activities, and reported a high level of life satisfaction.

On the basis of the above literature review,[2,11–14] we hypothesized that successful aging as defined above would be associated concurrently with specific sociodemographic, psychosocial, and behavioral determinants, in either univariate and/or multivariate analyses, as primary independent or correlated factors. They included age, gender, education, socioeconomic status (living in larger higher end housing type, or having little or no financial difficulty in paying medical bills), high levels of social network and support (being married, living with others, having someone to confide with, frequent visits or regular phone calls by children/relatives/friends, having someone to help when needed), religious/spiritual beliefs as a source of support/comfort, nonsmoking, nondaily alcoholic drinking, healthy eating, physical activities and exercise, good sleep, having time for leisure and low nutritional risk. Another primary hypothesis was that successful aging was associated in longitudinal analyses with subsequent better quality of life outcomes.[6]

We further demonstrated concurrent validity with secondary analyses that tested the hypothesis that

successful ageing defined as such was associated with variables representing physical functional substrates of well-being, which have been described in previous research to be significant correlates of health.[7–9] These included specific chronic medical conditions/illnesses (hypertension, dyslipidemia, diabetes, stroke, cardiac diseases, major eye disorders [cataract, glaucoma], musculoskeletal/motor disorders, gastric problems, respiratory problems), number of medical conditions/illnesses, body mass index, physical performance level (POMA), hearing problem, visual impairment, hospitalization, number of physician visits, use of multiple prescription drugs, use complementary/alternative medicine and vitamin supplements.

METHODS

Study Participants

This study formed part of the ongoing Singapore Longitudinal Aging Study (SLAS), a prospective community-based epidemiological cohort study of aging and health, which has been described previously.[15] The study was approved by the Institutional Review Board of National University of Singapore and participants signed written informed consent. Residents who were physically or mentally incapacitated to give informed consent or participate were excluded. During recruitment and baseline data collection between September 2003 and December 2004, all older adult residents aged ≥55 years (N = 2,804, 78% response rate) were identified by door-to-door census in South East Singapore for participation in the study. For the purpose of this study of successful aging, we performed cross-sectional analyses on the data of 1,281 Chinese participants, aged ≥65 years, who participated in the baseline interview. Longitudinal data analysis was performed for 865 participants who gave interviews at both baseline and follow-up 2 years later (31 died, 11 were unfit for reinterview, 170 were uncontactable, and 204 refused).

Participants underwent an extensive series of interviews, assessments, and tests at the study center. Structured interviews, physical performance tests, and clinical assessments were conducted by trained nurses. The participants' successful aging status and risk factors were determined from baseline interviews, and their quality of life status was assessed at 2 years follow-up interviews.

Definition of Successful Aging

Successful aging was operationally defined in terms of overall and physical health and well functioning, cognitive functioning and emotional well-being, social functioning, life engagement and life satisfaction, and a summary composite measure created across dimensions to form a dichotomous variable.

Measurements

Physical health and functional well-being was defined by "good or excellent" self-reported health status and being independent in instrumental activities of daily living (IADL).[16]

Cognitive well functioning and emotional well-being was measured by performance of the Mini Mental State Examination (MMSE ≥26) and a paucity of depressive symptoms on the Geriatric Depression Scale (GDS <5). The Chinese version of the MMSE that was validated in Shanghai[17] and in Singapore[18] was used. In this Chinese older population, the MMSE has been shown to have high sensitivity (96%) and specificity (84%) in identifying DSM–IV criteria-based cases of dementia. Depressive symptoms were assessed using a cutoff of 5/6 on the locally validated Chinese version of the GDS, which has been shown to have high sensitivity and specificity in identifying major depressive disorder.[19]

Social functioning and active engagement in life activities was assessed using a validated questionnaire[15] on the level of participation (often or at least once a week) in at least one listed social or productive activities, including social, recreational, civic activities, voluntary work, and paid employment or business, and domestic activities.

Overall positive life satisfaction was determined using a self-reported Life Satisfaction Scale comprising four questions that assessed the subjects' interest in life, happiness, loneliness, and general ease of living, which has been shown to predict mortality.[20] Respondents rated whether they find life "interesting or boring," "happy or sad," or "easy or hard" on a

5-point Likert scale (such as 1 = "very interesting" to 5 = "very boring"), or "lonely" (3-point Likert scale: 1 = not at all, 2 = fairly lonely, 3 = very lonely). The total summed score ranges from 4 to 18, with the lowest decile (score <11) indicating a positive life satisfaction.

Risk Factors, Correlates, and Outcomes of Successful Aging

Potential risk factors of successful aging included gender, age, education, housing status, marital status, living arrangement, social network and support, financial status, spirituality, smoking, alcohol, watch what I eat, exercise, good sleep, leisure time, and nutritional risk. Physical health and functional status included specific chronic medical illnesses and the number of comorbities, disabilities in instrumental activities of daily living, body mass index (BMI), gait and balance, and hearing and visual impairment were regarded as physical functional substrates of overall well-being and correlates of successful aging. Quality of life was considered as an outcome variable in the analysis.

Sociodemographic data included age, gender, ethnicity, and education. Financial well-being and security was measured by two variables: one variable determined the grade of housing accommodation according to public or private sector and floor space (number of rooms), which has been shown in numerous studies to be highly correlated to income and financial status; the second variable determined to what extent (1 = not at all or little, 2 = to some extent, 3 = to a great extent) the respondent was limited by financial resources to pay for needed health care.

Spirituality was assessed by an item that asked the respondent "to what extent are your religious or spiritual beliefs a source of support and comfort to you (1 = not at all or little, 2 = to some extent, 3 = to a great extent)?"

Social network and support was assessed by six items marital status (being married versus single, divorced, widowed), living arrangements (living with others versus living alone), having someone to confide with, regular visits at least once a week by children/relatives/friends in the last year, and regular phone calls at least once a week by children/relatives/friends in the last year, and having someone to help when needed (to some or a great extent).[21] Good social network and support was determined by three or more positive responses to the six items.

"Health behaviors" included smoking (current smokers versus ex-smokers and nonsmokers) and alcohol drinking (daily drank at least one alcoholic drink), and the reported frequency with which the respondents "watch what you eat," "performed physical activities or exercises," "have good sleep," "have time for leisure or relaxation" (never = less than once a month, sometimes = once a month or more but less than once a week, or often = once a week or more).

Health Status. Subjects were asked to report the presence in the 12 months prior to the interview of any of a list of 16 specified and other physician-diagnosed medical conditions. This was corroborated with their self-report of relevant surgical operations or procedures and physical identification of medications they currently took for their illnesses. Diagnoses of diabetes and hypertension were verified by the positive identification of medications, as well as fasting blood glucose and blood pressure. The number of chronic medical conditions was summed and categorized as "none, one or two, and three or more."

Healthcare Use. This included information on the frequency of hospitalization and physician visits in the 12 months period prior to the interview, vitamin and mineral supplements, and complementary and alternative medicine (CAM) use, determined by a detailed checklist of "nutriceuticals."

The nutritional risk status of the respondents was assessed by the Nutrition Screening Initiative (NSI) checklist[22] of 10 questions (Yes/No) on behaviors and circumstances that increase the risk of poor nutrition (having an illness or condition that made me change the kind and/or amount of food I eat; eat fewer than two meals per day; eat few fruits or vegetable or milk products (less than once a day); having three or more drinks of beer, liquor or wine almost every day; having tooth or mouth problems that make it hard for me to eat; do not always have enough money to buy the food I need; eat alone most of the time; take three or more different prescribed or over-the-counter drugs a day; without wanting, have lost or gained 10 pounds (4 kg) in the last 6 months; always physically unable to shop, cook and/or feed

myself). The weighted summed scores were used to categorize participants with no or low nutritional risk (score of 0–2) or moderate-to-high nutrition risk (score of 3 or more).

Body Mass Index (BMI) was calculated from weight and height (kg/m^2) and used to categorize participants as underweight (BMI <18.5), healthy range (BMI 18.5–22.9), overweight or obese (BMI ≥ 23.0), based on the revised cut-offs for Asian adult population, as recommended by the World Health Organization.[23]

The Performance-Oriented Mobility Assessment (POMA) of balance and gait was used to determine the mobility status of participants.[24] Sitting and standing balance (one leg, semitandem and tandem, heel, toe), as well as gait from walking down and back 10 m were each assessed on a three-point Likert scale (0,1,2). The summed score from the balance and gait scores (0 to 35), with higher scores denoting better mobility, was used.

Hearing impairment was determined by the whisper test at arm's length,[25] whereas visual impairment was defined by a logMAR score above 0.6 (equivalent to Snellen score worse than 20/80) in at least one eye.[26]

Quality of life status was determined at baseline and 2-year follow-up using the Chinese version of the Medical Outcomes study 12-item Short Form.[27] The SF-36 has been previously validated for use in Singaporeans.[28] Scores of the 12 items were summarized in two weighted summary scales: the Mental Component Summary (MCS) score and the Physical Component Summary (PCS) score. Scores range from 1 to 100, with lower scores indicating poorer health status.

Statistical Analyses

Successful aging was analyzed as the dependent variable in logistic regression models that included demographic, psychosocial, and behavioral variables as predictors. Variables representing physical and functional substrates of well-being were analyzed as correlates of successful aging in separate models. The association of successful aging as an independent variable with SF-12 MCS and SF-12 PCS quality of life scores at baseline and 2 years follow-up as the continuous dependent variable was analyzed using multiple regression models and analysis of variance.

Adjusted odds ratio (OR) and 95% confidence intervals (CI) and adjusted means were calculated from regression coefficient estimates, controlling for other covariables. The level for statistical significance was set at 0.05.

RESULTS

We interviewed 1,281 Chinese elderly, aged 65 or older, with mean age of 72.1 year (SD 5.8); 60% were women and 67% had primary education or below. Among them, 61.2% were found to be cognitively and emotionally well functioning; 47.9% were reportedly physically healthy and independent; 78.4% reported high social functioning; and 88.2% reported positive life satisfaction. Overall, 28.6% met the multidimensional criteria for successful aging (Table 1).

Table 2 compares sociodemographic, psychosocial, and behavioral factors among seniors showing successful (N = 366) and nonsuccessful aging (N = 915). Successfully aging respondents were significantly younger, better educated, were more likely to live in higher-end housing facilities, had better social network and support, were more likely to report religious and/or spiritual beliefs being a source of support and comfort, and having fewer financial difficulties. Successfully aging seniors more frequently reported having regular physical activities or exercise and little or no nutritional risk. Smoking, alcohol drinking, "watching what I eat" and having time for leisure were not found to be significantly

TABLE 1. Prevalence of Successful Aging in Chinese Elderly Aged 65+

	Prevalence
Total sample size at baseline	1,281
1. Physical health and well functioning	47.9
Good or excellent self-reported health status	64.6
Independent in instrumental ADL	67.1
2. Cognitive and emotional well functioning	61.2
MMSE ≥26	68.1
GDS <5	87.0
3. High social functioning and active life engagement	78.4
Engaged in at least one social activities	82.8
Engaged in at least one productive activities	90.7
4. High life satisfaction (score <11)	88.2
Successful aging[a]	28.6

Note: Values are in % unless otherwise stated.
[a]Combined criteria (1 and 2 and 3 and 4).

TABLE 2. Associations of Sociodemographic, Psychosocial, and Behavioral Determinants of Successful Aging in Chinese Elderly Aged 65 Years or Older

	Nonsuccessful Aging	Successful Aging	Chi-squared Test	df	p	Multivariate Analysis			
						Adjusted OR (95% CI)	Wald Test	df	p
Total sample size	915	366							
Age, yr, mean (SD)	72.9 (6.1)	69.7 (4.2)	9.2	1,279	<0.001	0.90 (0.88-0.93)	45.8	1	<0.001
Female	59.2	62.3	1.0	1	0.31	1.37 (1.02-1.85)	4.4	1	0.04
More than 6 years of education	26.1	51.6	76.5	1	<0.001	2.31 (1.71-3.10)	29.9	1	<0.001
Housing type: larger (>3 rooms) public/private housing	59.5	76.2	32.0	1	<0.001	1.41 (1.03-1.93)	4.6	1	0.03
Social network and support									
Being married (versus single, divorced, widowed)	65.6	71.9	4.6	1	0.032				
Living with others (versus living alone)	91.1	92.1	0.3	1	0.56				
Having someone to confide with	92.2	98.1	15.5	1	<0.001				
Frequent visits by children/relatives/friends	73.6	77.2	1.8	1	0.18				
Having regular phone calls by children/relatives/friends	78.7	86.2	9.5	1	0.002				
Having someone to help when needed	88.3	96.2	18.7	1	<0.001				
Having 3 or more of the factors above	87.5	93.7	10.4	1	0.001				
"No or little" financial difficulty in paying medical bills	49.0	53.2	1.8	1	0.18				
Religious/spiritual beliefs source of support/comfort to great extent	21.6	32.5	16.5	1	<0.001	1.64 (1.22-2.22)	10.4	1	0.001
Non or ex-smokers (versus current smokers)	92.0	94.5	2.5	1	0.12				
Alcoholic drink daily	6.3	9.0	2.8	1	0.09				
Watch what I eat (often or sometimes)	64.8	68.0	1.2	1	0.28				
Physical activities and exercise (often or sometimes)	69.7	83.9	27.3	1	<0.001	1.90 (1.35-2.68)	13.4	1	<0.001
Good sleep (often or sometimes)	71.9	75.4	1.6	1	0.20				
Time for leisure (often or sometimes)	60.6	60.7	0.01	1	0.99				
No or low nutritional risk (NSI score <3)	59.7	77.0	34.3	1	<0.001	2.16 (1.60-2.92)	25.3	1	<0.001

Notes: Values are in % unless otherwise stated. Independent t-test for mean and χ^2 test for proportion. The full model includes all other variables shown in previous tables. For clarity, only significant correlates of successful aging were shown in this table. Similar results were obtained in stepwise selection models.

different between successful and nonsuccessful aging seniors.

In multivariate analyses, the significant independent determinants of successful aging were younger age, female gender, higher-end housing, better education, physical activities and exercise, having religious and/or spiritual beliefs as a source of support/comfort, and low or no nutritional risk.

There were significant differences in health status and health care use between successful and nonsuccessful aging seniors (Table 3). Successful aging respondents reported significantly fewer chronic med-

TABLE 3. Physical Health Status and Healthcare Use Correlates of Successful Aging in Chinese Elderly Aged 65 Years or Older

	Nonsuccessful Aging	Successful Aging	Test Statistic	df	p
Self-reported chronic medical conditions/illnesses					
Hypertension	67.2	57.4	11.0	1	0.001
Dyslipidemia	59.8	59.3	0.03	1	0.87
Diabetes	24.0	12.3	22.0	1	<0.001
Stroke	6.0	1.1	14.4	1	<0.001
Cardiac diseases:	13.9	6.0	15.7	1	<0.001
Ischemic heart disease/IHD	8.9	4.6	6.6	1	0.01
Atrial fibrillation	1.6	0.3	4.0	1	0.05
Heart failure	6.9	2.2	11.0	1	0.001
Major eye disorders (cataract, glaucoma, etc.)	48.7	42.9	3.6	1	0.06
Musculoskeletal/motor disorders[a]	22.1	18.9	1.6	1	0.20
Gastric problems	3.1	2.2	0.7	1	0.39
Respiratory problems[b]	38.4	27.3	14.0	1	<0.001
Number of medical conditions/illnesses					
None	5.5	7.9	23.5	1	<0.001
One or two	36.7	49.2			
Three or more	57.8	42.9			
Body Mass Index (kg/m^2)					
Underweight (<18.5)	7.8	4.1	6.3	1	0.04
Healthy range (18.5–22.9)	38.3	42.5			
Overweight and obese (≥23)	53.9	53.4			
POMA[c] score, mean (SD)	30.8 (5.0)	33.0 (2.1)	8.1	1268	<0.001
Hearing problem	3.9	3.0	0.6	1	0.42
Visual impairment[d]	34.6	19.2	29.0	1	<0.001
Hospitalization (>=1) in past year	5.5	3.0	3.6	1	0.06
Number of physician visits in past year, mean (SD)	5.0 (6.2)	3.8 (5.2)	3.5	1279	0.001
Use of multiple (≥5) prescription drugs	19.5	7.7	27.0	1	<0.001
Use complementary/alternative medicine	36.0	44.8	8.3	1	0.004
Use vitamin supplements	36.6	44.0	6.0	1	0.02

Note: Values are in % unless otherwise stated; Independent t-test for mean and χ^2 test for proportion.

[a]Arthritis, knee or back pain, hip fracture, osteoporosis.

[b]Asthma, COPD, Chronic bronchitis (cough up with phlegm on most days for 3 consecutive months in past yr), spirometric-based FEV1/FVC <0.7.

[c]Performance-oriented mobility assessment for balance and gait; maximum possible score = 35, higher score denoting better function.

[d]Visual impairment: very low visual acuity of log MAR >0.6 (Snellen 20/80).

ical problems, fewer numbers of medical illnesses, and had better POMA scores of mobility. They showed similar proportions of overweight and obesity, more normal weight, and fewer underweight. Visual impairment was less frequent in successful aging respondents, but there were no significant differences in hearing impairment. Successful aging seniors reported fewer physician visits, less multiple (≥5) prescription drugs use, and more alternative medicine or vitamins use.

Compared with seniors who did not participate in the follow-up interviews, participants with follow-up data showed better baseline ratings on IADL performance (p <0.001), GDS scores (p = 0.05), MMSE scores (p <0.001), SF-12 MCS (p = 0.002), and PCS scores (p = 0.02) (data not shown). In this group of followed up participants, baseline successful aging status was found to be significantly associated with better scores of the SF-12 quality of life at baseline and at 2 years in both cross-sectional and longitudinal analyses (Table 4).

DISCUSSION

The data in this study supported the construct and predictive validity of a proposed multidimensional model and operational definition of successful aging in Chinese seniors. It demonstrated good convergent validity with concurrent health status and health care use parameters and predicted subsequent levels of quality of life. By virtue of its broad multidimensional construct, successful aging was shown to be associated with a multiplicity of demographic, environmental, psychosocial, and behavioral determi-

TABLE 4. Associations of Successful Aging With Quality of Life in Chinese Elderly Aged 65+ (Cross-Sectional and Longitudinal Analyses)

	Adjusted Mean (SE)				
	Nonsuccessful Aging	Successful Aging	Test Statistic	df	p
Crosssectional analysis (N = 1,281)					
Physical well-being score (PCS-SF12)	46.8 (0.35)	50.8 (0.44)	70.8	1,1274	<0.001
Mental well-being score (MCS-SF12)	53.3 (0.40)	56.1 (0.50)	28.5	1,1274	<0.001
Longitudinal analysis (N=865)					
Physical well-being score (PCS-SF12)	48.8 (0.37)	50.0 (0.46)	5.8	1,856	0.02
Mental well-being score (MCS-SF12)	56.1 (0.38)	57.6 (0.47)	7.9	1,856	0.005

Notes: Test: ANOVA; Higher scores denote better quality of life. Models were adjusted for age, education, gender, medical comorbidities; and the longitudinal models were adjusted for length of follow-up, and their respective baseline score. Test statistic was quoted from the adjusted models.

nants, notably more in numbers and strength of association than those shown in studies that used restricted biomedical and physical functional definitions of successful aging.

Studies using a biomedical model of successful aging generally reported a lack of association with gender, income, education, and marital status.[9] Our results are in good concordance with two studies both of Chinese elderly in Hong Kong and Shanghai,[11,12] which also used multidimensional criteria including cognitive functioning, affective status, and productive involvement. Both studies identified the factors most related to successful aging to be sociodemographic such as younger age, gender, education, being married, financial well-being, and leisure activities. Also, recent focus group studies of older adults[4] have shown that they place less emphasis on factors such as longevity, genetics, absence of disease or disability, function and independence, but more emphasis on psychosocial factors as keys to successful aging. A significant observation is that positive attitude and adaptation strategies often compensated for impaired physical health, and furthermore, active social engagement required a foundation of security and stability.[4]

In consonance with this lay model of successful aging, we found that education, better housing, better social network and support, spirituality, and nutrition were salient factors associated with successful aging. The importance of spirituality was particularly worth noting, given that religious and/or spiritual beliefs play positive roles in mental and psychosocial well-being,[14] but it is rarely studied. Among behavioral factors, the associations of nonsmoking and physical activities and exercises are not unexpected, but the positive association of nutri-

tional risk status with successful aging is worth noting and has been investigated in very few studies.[13]

These observations are of great relevance to geriatric psychiatry because it implies that care providers should begin to help seniors age successfully beyond a limited sphere of attention to physical and mental health needs and encompass a broader range of activities directed at social, behavioral, and spiritual needs. This calls for a holistic care model for the aged with interfacing of activities and care in the community and possibly within the framework of a population-based program of multifaceted interventions. Future research should be directed at empirical validation of a multidimensional framework for understanding and promoting successful aging.

There are presently no consensus and no uniform operational criteria to define successful aging. Terms such as active aging, healthy aging, productive aging, and positive aging are sometimes used synonymously and interchangeably, but carry different nuances of meaning and emphasis, especially when used as policy slogans. Successful aging and active or healthy aging are semantically the closest, one incorporating the notion of attainment of complete well-being, and the other, the notion of desired behavioral performance.

Whether a given set of operational criteria can universally tap the contents of successful aging is arguable. There may also be domain variations among multidimensional models of successful aging depending on the interventional perspectives and framework. Studies vary in the way constituents of successful aging are used as precursors or outcomes. Thus, alike some studies, we have considered life satisfaction to be a component of successful aging, but this was used as a predictor in other studies.[29]

In some studies, participation in leisure activities was not included as a defining component of successful aging, but was found to "predict" successful aging.[14,30]

Given that different criteria are used to define successful aging in various studies, there is also debate about the appropriate cutoff points in measures used. The reported prevalence of successful aging in publications therefore varies widely and cannot be meaningfully compared. Previous studies that have also used maximum/optimum cutoff scores based on various biomedical and other models[6,26] have variously reported the prevalence of successful aging at between 16% and 34%. Our operational criteria used to define successful aging, based on the maximum score (4/4) for the proposed model, was similarly restrictive, and it generated a prevalence figure within the range of these reported figures. There is arguably a universal case for a less restrictive definition and criteria because seniors may still consider themselves to be aging well because of their transcendental experience of positive psychological and social well-being despite deteriorating health and physical functioning.[10] This will increase the distribution of successful aging to a majority of the population, but the appropriate normative level requires further investigation and consensus.[31]

Several other limitations in this study should be noted. The use of some measures and cutoffs such as MMSE ≥ 26 and GDS <5 does not identify successfully aging participants who are at the highest level of cognitive and emotional functioning and well-being. Furthermore, because education is also known to be associated with MMSE performance in this population, the prevalence of successful aging in less educated seniors may be underestimated as a result. Nevertheless, by using stratified MMSE cutoffs according to educational levels, education remained a significant determinant of successful aging. Another limitation was that although the SF-36 was previously validated for use in the local population, we have used the SF-12 version in this study. There was likely bias from loss to follow-up in the longitudinal analysis; participants in the follow-up study tended to be in better health and functioning. Because of their better aging profile, the observed association with quality of life may be underestimated. The number of medical comorbidities was not based on self-report of medical conditions. Nevertheless, previous research has shown that self-report of most chronic illnesses are valid and useful for research.[32,33] The strengths of the study include the large, population-based sample and the use of a multiplicity of measures that are less often present in other studies.

CONCLUSION

In contrast to studies based on more restricted biomedical definitions of successful aging that showed a preponderance of health-related determinants, this study identified more demographic, psychosocial, and behavioral determinants including nutrition and spirituality in a multidimensional construct of successful aging among Chinese elderly populations.

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Appendix 2. Gwee X, Nyunt SZ, Kua EH, Jeste DV, Kumar R, Ng TP. Accepted for publication by the American Journal of Geriatric Psychiatry, Sept 2013.

Reliability and Validity of a Self-Rated Analogue Scale for Global Measure of Successful Ageing

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Abstract

Objective: Dimension-specific objective measures are criticized for their limited perspective and failure to endorse subjective perceptions by respondents, but the validity and correlates of a subjective global measure of successful aging (SA) are still not well established. We evaluated the reliability and validity of a self-rated analogue scale of global SA in an elderly Singaporean population. **Design:** Cross-sectional data analysis using a comprehensive questionnaire survey. **Participants and setting:** 489 community-dwelling Singaporeans aged 65 and over. **Measurements:** Self-rated SA on an analogue scale from 1 (least successful) to 10 (most successful) was analysed for its relationship to criterion-based measures of 5 specific dimensions (physical health and function, mental well-being, social engagement, psychological well-being, and spirituality/religiosity), as well as outcome measures (life satisfaction and quality of life). **Results:** Self-rated SA was significantly correlated to measures of specific dimensions (standardized beta, β from 0.11 to 0.39), most strongly with psychological functioning (β=0.391). The 5 dimension-specific measures together accounted for 16.7% of the variance in self-rated SA. Self-rated SA best predicted life satisfaction (R^2=0.26) more than any dimension-specific measure (R^2 from 0.05 to 0.17). Self-rated SA, vis-à-vis dimension-specific measures, was related to a different set of correlates, and was notably independent of chronological age, gender, education, socio-economic status, and medical comorbidity, but was significantly related to ethnicity.

Conclusion: The self-rated analogue scale is a sensitive global measure of SA encompassing a spectrum of underlying dimensions and subjective perspectives and its validity is well supported in this study.

INTRODUCTION

Population ageing is associated with an increasing societal burden of care, especially acutely in Asia and the developing world. Successful ageing (SA) is, therefore, an important area of research that is of particular relevance and importance to the design of programmes to promote well-being among older people(1).

Diverse approaches in conceptualizing and defining SA have resulted in a number of competing operational models of SA today. The biomedical model embodied by the expanded definition by Rowe and Kahn(2) focusses on the avoidance of disease and maintenance of physical and cognitive functioning and active life engagement. Sociological models based on the continuity and other theories emphasize social functioning, and view successfully ageing individuals (1, 3) maintaining high levels of social activity, interaction, and participation(1). Psychological models of SA variously emphasize mastery/growth, positive adaptation, resilience, and the ability to possess and use psychological resources for coping with the challenges of the ageing process (4-6). There is however emerging consensus that SA is a multi-dimensional construct(7, 8). Furthermore, some authors have argued that positive religiosity/spirituality is a missing element in the SA literature, and should be regarded as integral to SA(9).

Dimension-specific formulations have been criticized for failing to incorporate subjective perspectives of older adults themselves(10, 11). Many authors emphasize that it is important to elicit older people's views and perceptions of what it means for them to age well(8, 12). Research show that many older adults consider themselves to be ageing successfully even though the biomedical criteria do not categorize them as such(6, 13, 14). ore older adults were rated as 'successful agers' by a subjective measurement scale,

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whereas fewer were rated as successful agers when objectively-defined criteria were applied(10, 15) .

A single-item analogue scale is arguably a sensitive tool in measuring subjective global SA (1). Analogously, a global measure of subjectively rated health has been found in numerous studies to predict mortality independently of disease and disability among elderly persons(16). Self-rated SA may also be a similarly important and valid measurement construct, but few studies have established the validity of a subjective global measure of SA. In this regard, the choice of external criteria to validate subjective SA measure is also not straightforward. Nevertheless, many studies have regarded life satisfaction and quality of life as outcome indicators and criterion measures of SA(17).

In this study, we examined the construct and criterion validity of a self-rating scale of SA in an aging Singaporean population. Based on the holistic view that SA encompasses a spectrum of underlying dimensions, we hypothesized that subjective self-rating of global SA was correlated to measures of specific dimensions of SA but was a stronger predictor of life satisfaction and quality of life. We examined the correlates of successful ageing, and hypothesized that the subjective global measure of SA, vis-à-vis dimension-specific measures, was related to a different set of correlates. Given the subjective perspective of self-rated SA measures, we predicted that it would be independent of age, gender, education and health status.

METHOD

Participants and study design

This study (Singapore Study of Successful Ageing, SSOSA) formed part of a second wave population-based study of ageing and health (Singapore Longitudinal Ageing Studies,

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SLAS-2) which enrolled 2,800 community-dwelling older adults aged 55 and above living in the South-Central and South-West of Singapore in 2009-2011. Participants were recruited through door-to-door census and completed an extensive range of interviews and physical examinations.

The participants in the SSOSA were a subsample (N=500) of the SLAS-2 cohort who were aged 65 and above living in one locality (Bukit Merah) in the South-Central region. Eligible participants were Singaporean citizens or permanent residents who were able to give informed consent. Participants too frail or unable to complete the interview, for reasons such as from post-stroke aphasia or profound dementia, were excluded. Respondents who consented to participate in the study represented a response rate of 78.5%. The study was approved by the National University of Singapore Institutional Review Board.

Questions from the Stein Research Institute for SA Questionnaire developed at the University of California, San Diego(13, 18) were adapted for local use. The original questionnaire was translated into Chinese and Malay, and items deemed culturally and linguistically biased were given their semantic equivalents in the local languages/dialects. The questionnaire was administered in face-to-face interviews conducted in the language and dialect of preference at the respondents' homes by a multi-ethnic team of trained research nurses.

Measurements

Self-rating of global successful aging

Participants were asked to rate their own level of SA on an analogue scale from one to 10 (1=least successful to 10=most successful). The statement asked: Where do you rate

yourself in terms of "successful aging?"(13, 18). To assess the test-retest reliability of the scale, research nurses subsequently administered the scale to the same participants in a convenience sample (N=33) twice: at baseline and about two weeks later.

Physical Health and Function

Chronic illness. The presence of illness was assessed by asking participants to indicate whether they had been diagnosed and treated for any one or more from a list of 20 chronic medical conditions, including high blood pressure, diabetes, coronary heart disease, cardiac failure, stroke, arthritis, asthma/COPD, cancer, and others.

Instrumental activities of daily living [IADL](19). Participants were asked how much help they required for performing eight tasks which include using telephone, travelling, shopping, preparing meals, housework, doing laundry, taking medicine, and managing money.

Self-reported health status. Participants were asked to rate their own health on a 5-point scale (1=poor to 5=excellent).

Measures of Mental/Cognitive Well-being.

Cognitive Failures Questionnaire [CFQ(20)]. Daily living failures in memory, perception, and motor control were assessed by 20 items from the CFQ questionnaire including questions such as 'Do you forget appointments?' and 'Do you leave important phone calls, or letters unanswered for days?' Each item was scored on a 5-point scale (1=never to 5=very often). Summed scores ranged from 0 to 80 and higher scores indicate poorer cognition.

Geriatric Depression Scale-15 items (GDS-15). Depressive symptoms were assessed and scored (0,1) on 15 items using a locally translated and validated version of the GDS-15.*(21)* GDS-15 score of five or higher denotes clinically relevant threshold level of depressive symptoms.

Self-reported Mental Health. Participants were asked to rate their own mental health from a scale of 1-5 (1=poor to 5=excellent).

Social Engagement.

Leisure time activities. Participants reported how often during the past month (1=never to 6=everyday) they participated in social, productive, and individual activities from a list that included reading, volunteering, cooking, visiting family and friends, and engaging in sports activities/exercises such as swimming or walking.

Social Support/network with Friends and Family was assessed by how often friends or family members made participants feel loved and cared for; willing to listen when participants need to talk about their worries/problems; willing to help participants with daily tasks such as shopping; give participants advice about medical, financial, or family problems; make too many demands on participants; critical of what participants do; and whether participants feel lonely. Each item was scored on 4-point scale with higher scores indicating greater support.

Measures of Psychological Well-being.

Resilience was measured using the Connor-Davidson Resilience Scale [CD-RISC](22), a 25-item questionnaire with each item scored on a five-point scale (0=not true at all to 4=true nearly all the time). Scores ranged from 0-100, higher scores indicate greater

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resilience. Factor analysis of the scale in older cohorts(23) yielded four factors: 1) personal control and goal orientation, 2) adaptation and tolerance for negative affect, 3) leadership and trust in instincts, and 4) spiritual coping.

Mastery. The Pearlin Mastery Scale [LASA-D](24) was used to assess the extent of participants' sense of control over life outcomes. Examples of questions include: "I often feel helpless in dealing with the problems of life" and "What happens to me in the future mostly depends on me". Each item was scored on a 4-point scale (1=strongly agree o 4=strongly disagree), and higher summed scores indicate greater mastery.

Optimism. The Life Orientation Test-revised [LOT-R](25, 26) measuring individual differences in generalized optimism versus pessimism was used. Examples include "In unclear times, I usually expect the best" and "I rarely count on good things happening to me". Each of the six items were scored on a 5-point scale (1=strongly disagree to 5=strongly agree) and higher summed scores indicate greater optimism.

Measures of Spirituality and Religiosity.

Participants were asked five questions relating to spiritual/religious activities and beliefs. Items were "How often do you attend church, synagogue, or other religious meetings?"; "How often do you spend time in private spiritual activities, such as prayer/mediation"; "In my life, I experience the presence of the Divine"; "My spiritual beliefs are what really lie behind my whole approach to life"; and "I try hard to carry my spiritual beliefs over into all other dealings in life". Each item was scored on a 6-point scale (0=never/definitely not true to 5=more than once a week /definitely true). Greater scores (range 0-25) indicate more spiritual/religious engagement.

Outcome Measures

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Health-related quality of life was measured using the 36-item Short-Form Health Survey (SF-36)(27, 28) which has been validated for use in the local population(29). Weighted summed scores were calculated for Physical Component Score (PCS) and Mental Component Score (MCS), ranging from zero (lowest level of functioning) to 100 (highest possible level of functioning.

Life satisfaction was measured using two measures. The Satisfaction with Life Scale [SWLS](30), a validated 5-item measurement scale assesses general satisfaction with life. Sample questions include "In most ways my life is close to my ideal" and "The conditions of my life are excellent", each scored on a 7-point scale (1=not at all true to 7=absolutely true); higher summed scores indicate better life satisfaction. Global self-satisfaction was measured using a single item asking respondents to rate their overall satisfaction with life during older adulthood (65+ years) on a 10-point scale (1=Not at all satisfied to 10=very satisfied).

Dimensional measures of successful ageing

The raw scores of component measures of *physical well-being (*IADL, chronic illness and self-reported health status), *mental well-being (*CFQ , GDS-15 and self-reported mental health), *social well-functioning (*level of social/productive/individual activities, and amount of social support/ network from friends and family), and *psychological well-functioning (*CD-RISC, LASA-D and LOT-R) were recoded for higher scores to indicate better functioning. The scores were converted to z-scores and averaged into a single summary measure of physical well-being, mental well-being, social well-functioning, psychological well-functioning, and spiritual wellbeing.

STATISTICAL ANALYSES

Data from 489 participants were analyzed after excluding those with incomplete data. The relationships between dimensional and global measures of SA were explored in linear regression models which analyzed each of the dimensional measures individually as predictor variables of self-rated global SA score (DV), and in hierarchical models added sequentially the five dimensional measures and evaluated the change in model R-squared.

We evaluated the criterion validity of the self-rated global SA by examining it as an independent variable in linear regression analyses predicting two outcome indicators, life satisfaction and quality of life. The latter included two measures of life satisfaction: the single item of global life satisfaction and the SWLS; and the SF-36 PCS and MCS measures of quality of life. Its model R-squared values were compared with those of separate models of dimensional measures of SA predicting life satisfaction and quality of life measures.

Finally, we used forward stepwise multiple regression analyses to identify significant independent correlates of global and dimensional measures of SA, using $p<0.20$ for inclusion and $p<0.05$ for retention in the model. All analyses were done using Statistical Package for Social Sciences, version 18 (SPSS Inc, Chicago, IL).

RESULTS

Study Sample Characteristics

The study sample characteristics are shown in Table 1. The mean age of participants was 72, there were slightly more females, and majority were of Chinese ethnicity. The mean score of self-rated SA was 6. 8. Test-retest reliability of the scale was very high, $r=0.93$, $n=33$, $p<0.001$.

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Relationship between dimensional and global measure of SA

Simple regression modeling (Table 2) showed that all the dimensional measures of SA used were significantly correlated with self-rated global measure of SA, with the psychological measure being most strongly correlated and accounting for the most variance (16%). In hierarchical models, the consecutive inclusions of mental, social, psychological, and spiritual dimensions onto the base biomedical model (physical health and functioning) resulted in statistically significant incremental increase in the variance of self-rated global SA accounted (model R-squared values). The complete multi-dimensional measure of SA using all the components accounted for almost 17% of the variance in self-rated SA.

Prediction of life satisfaction and quality of life

Table 3 showed the results from linear regression analyses comparing the performance of the self-rated global versus dimensional measures of SA in predicting life satisfaction and quality of life. Compared with dimensional measures of SA, self-rated SA measure was most strongly associated with both single-item and multiple-item measures of life satisfaction. Next to the psychological measure of SA, self-rated SA was most strongly associated with SF-36 MCS measure of quality of life, but was least associated with SF-26 PCS measure of quality of life.

Correlates of successful ageing

In stepwise regression analyses of socio-demographic predictors of dimensional and self-rated measures of SA, (Table 4), chronological age was the only significant socio-demographic correlate ($F(1, 397)=34.89$, $p<.001$) for the biomedical model of SA. Chronological age, education, housing type, gender, and marital status were significant correlates of the social functioning model, $F(5, 405)=15.77$, $p<.001$. For the psychological

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model, education, housing type, and ethnicity were significant final correlates, $F(3, 426)=11.55$, $p<.001$. Chronological age, education, ethnicity, and housing type were significant correlates of the biopsychosocial model, $F(4, 361)=13.98$, $p<.001$. Finally, for the self-rated global SA model, Indian ethnicity was the only significant negative correlate, $F(1, 438)=7.55$, $p=.006$.

DISCUSSION

In this study, we found good support for the validity of a self-rated global measure of SA. It had excellent test-retest reliability, and its significant correlations with dimensional measures of SA were consistent with its attribute as a measure encompassing the spectrum of underlying dimensions of SA (physical health, mental well-being, social functioning, psychological well-functioning, and religiosity/spirituality). Its strongest correlation with psychological functioning accord with studies indicating that older adults strongly identified psychological wellbeing, more than physical wellbeing to be especially important for ageing well, (14, 18).

There was also good empirical support for the contribution of positive religiosity/ spirituality, although relatively small, to SA. This is consistent with the argument by some authors that spirituality should be an element in SA, and with empirical findings in previous studies conducted with Malaysian Malays(31) and Singaporean Chinese(11) and Indians(32).

Although the measures of multiple dimensions of SA were significantly associated with self-rated global measure of SA, a large proportion of the underlying dimension(s) of SA remained unmeasured. This may be due to unmeasured or unknown domains in the dimensional construct of SA, and inherent limitations of the dimensional measurement

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scales used. As no measurement scales are likely to fully tap and measure all the possible domains, the use of a global measure of SA is justified and supported by this study.

The criterion-based validation of the self-rated global measure of SA was supported in this study showing it as a stronger predictor of life satisfaction, in comparison to dimensional measures of SA. The self-rated global measure of SA, next to the psychological measure of SA, was also found to be strongly predictive of SF-36 mental component score of health-related quality of life. Since the SF-36 is primarily designed to measure *health-related* quality of life, its use as a measure of quality of life has limitations in this study. This explains the poor performance of the self-rated global measure of SA in predicting SF-36 PCS measure of physical dimension of quality of life, and the results are therefore not surprising. On the other hand, dimensional measures (particularly biomedical) were better than self-rated global SA in predicting SF12-PCS measure of quality of life.

Another limitation is the conceptual ambiguity in regard to the use of life satisfaction and quality of life as appropriate outcome indicators for criterion-based evaluation. They bear close semantic resemblance to successful ageing, and life satisfaction and quality of life are sometimes viewed as precursors or constituents of SA. However, SA may be appropriately used as a predictor (or outcome) variable in different analytical contexts. An analogy is that health status is often analyzed as an outcome variable but may be viewed as a predictor variable for mortality.

We examined and found different sets of correlates of SA for self-rated global and dimensional measures of SA. It is particularly meaningful to note that the self-rated global measure of SA was not associated with chronological age, gender, education, and socio-economic status, (except Indian ethnicity). This is consistent with the subjective perspective

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of SA discussed above, and the underlying notion that perceived SA transcends the limitations of demographic, socio-economic and health status. In other words, older individuals may still consider themselves to be ageing well regardless of their chronological age and gender, or even if they were uneducated or poor. Thus, it's non-dependence on chronological age, gender, education, and socio-economic status is arguably a desirable attribute in a measurement tool for use in many situations.

However, a caveat is that the observed lack of correlations may not be surprising as correlates of SA have been found to be fairly inconsistent across studies(10), possibly explained by cultural perceptions of ageing. Two previous U.S. studies have used the self-rated global measure of SA. The first study (14) like our study found that self-rated SA was not related to chronological age, gender, ethnicity, marital status, education or income, whereas the second study (15) found that self-rated SA was related to chronological age and education. In different populations and culture, therefore, it is possible that, depending on the relative importance of underlying domain components of SA and the relative prevalence of their correlates, self-rated SA may have a few demographic correlates. This should be examined in further studies.

Indian ethnicity emerged as the only significant negative correlate of self-rated global SA. This ethnic group comprised the smallest percentage of the sampled population (4.3%). Indian ethnicity was also a significant negative correlate with SA in the psychological model, and this is consonant with the parallel finding that self-rated SA was mostly correlated with psychological functioning. Only Malay ethnicity was a significant positive correlate of SA in the biopsychosocial model, but not in the global SA model. Existing literature attests to the importance of ethnicity and culture as a cross-cutting factor in SA. Culture embraces systems of ideas, values, and customs in regards to the ageing process

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that influence societal expectations and behaviours toward older people(33), and older individuals' personal views, expectations, and adaptations in regard to their own aging process and well-being (34, 35). Further studies of the ethnic differences and cultural dimensions of self-rated SA are desirable.

In the present study, the self-rated global SA scale was administered by face-to-face interviews in contrast to other studies which used the same scale via take-home (13) and mail-in (18) survey methods. Due to the high illiteracy rate of this study population, face-to-face interview was deemed desirable to ensure that the respondents understood well what the question asked. The notion of successful ageing and many synonymous terms is relatively recent, and its incorporation into the language of a particular culture is likely to vary depending on its stage of socio-economic development. Hence, it is essential that the single-item scale administered by any method in any culture be based on reasonably good understanding of the term.

The present study supports the validity of a simple analogue scale measuring subjective global SA. Its measurement reflects the sensitive valuation by the respondent, capturing implicit information that are otherwise not extracted with criteria-based measures,. This has important implications for policies and programmes planning. Criterion-based dimensional measures of SA, given some practical limitations, remain potentially useful in programme monitoring and evaluation for relevant outcomes. On the other hand, self-rated global SA measured with a simple analogue scale, may be recommended as a universally acceptable standard measurement of global SA for use in population monitoring and comparative analyses.

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DECLARATION OF INTEREST

The authors declare no conflicts of interest in relationship to the current study.

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Table

Table 1. Characteristics of Study Sample (N=489)

		N	%
		Mean	(SD), range
Age, yr, mean (SD)		72.2	(5.7), range 65-93
Gender	Female	294	60.1
	Male	195	39.9
Ethnicity	Chinese	416	85.1
	Malay	52	10.6
	Indian	21	4.3
Marital Status	Single	31	6.3
	Married	263	53.8
	Widowed	161	32.9
	Separated, divorced	30	6.1
Living arrangement	Alone	104	21.3
	With spouse/children	355	72.6
	With friends, others	26	5.3
Education	6 years or less	378	78.9
	More than 6 years	101	20.7
Housing type	2-room or smaller	147	30.1
	3-room or larger	321	65.6
Chronic illness	More than 3	43	8.8
Self-rated health	Good to excellent	353	72.2
IADL (8 items)	Independent on all items (0)	377	77.1
Self-rated successful ageing		6.8	(1.6), range 2-10
Social/productive/physical activities score		11.0	(4.82), range 1-24
Social support score		16.7	(3.7), range 4-21
GDS-15 score		1.2	(2.1), range 0-13
GDS-15 score <5		442	90.4
Cognitive failure scores		61.8	(9.8), range 21-80
Resilience score		60.3	(11.4), range 18-100
Mastery score		19.2	(2.4), range 11-38
Optimism score		20.1	(2.4), range 14-27
Religiosity and spirituality score		11.7	(8.3), range 0 -25
SF-36 MCS		54.3	(7.1), range 24.76-67.92
SF-36 PCS		47.5	(8.1), range 19.82-60.50
Global self-satisfaction		7.1	(1.9), range 1-10
SWLS score		24.5	(5.7), range 8-35

Test: Descriptive statistics for mean and proportion.
GDS-15= Geriatric Depression Scale
IADL= Instrumental Activities of Daily Living
SF-36 MCS= Short-Form Health Survey Physical Component Score
SF-36 PCS= Short-Form Health Survey Mental Component Score
Global Self-satisfaction= Self-satisfaction at present older adult life stage [single item, scale from 1-10]
SWLS= The Satisfaction with Life Scale

1

Table 2. Simple correlation/ regression analyses of global successful ageing score (dependent variable) predicted by dimensional measures of successful ageing (N=498)

Independent variables: successful ageing models	Stand. Beta	P	F-test value	df	R^2	R^2 Change
Uni-dimensional models						
Physical health and function	.182	<.001	15.6	1,456	.033	
Mental well-being	.270	<.001	33.8	1,432	.073	
Social functioning	.139	<.01	8.92	1,456	.019	
Psychological	.394	<.001	87.7	1,477	.156	
Spirituality	.110	<.05	6.0	1,488	.012	
Multi-dimensional models						
Physical health and function	.182	<.001			.033	.033
Physical health and function + Mental	.273	<.001	33.9	1,421	.075	.042**
Physical health and function + Mental + Social	.297	<.001	38.0	1,393	.088	.013**
Physical health and function + Mental + Social + Psychological	.383	<.001	66.2	1,386	.147	.059**
Physical health and function + Mental + Social + Psychological + Spirituality	.409	<.001	77.4	1,386	.167	.020**

Test: Linear regression modelsTotal Multiple R-squared: 0.167Physical health and function= IADL, Chronic Illness, Self-reported health status

Mental= Cognitive Failures Questionnaire, GDS15, Self-reported mental health

Social= Leisure-time physical, social and productive activities, Social support/network from friends and family

Psychological= CD-RISC (Resilience), Pearlin Mastery scale, Life orientation test (Optimism)

Spirituality/Religiosity= Amount of engagement in such activities

**$p<.01$; *$p<.05$

2

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Table 3. Regression analyses of successful ageing models as predictors of life satisfaction and quality of life

Successful ageing models	Dependent variable																				
	Global Self-satisfaction					Satisfaction with Life [SWLS]					SF-36 (PCS)					SF-36 (MCS)				
	Beta	p	F-test value	df	R²	Beta	P	F-test value	df	R²	Beta	P	F-test value	df	R²	Beta	p	F-test value	df	R²
Biomedical	.294	**	39.4	1,419	.086**	.223	**	21.9	1,421	.050**	.488	**	131.5	1,421	.238**	.291	**	38.9	1,421	.085**
Social Functioning	.225	**	24.0	1,453	.050**	.252	**	30.9	1,455	.064**	.302	**	45.7	1,455	.091**	.212	**	21.5	1,455	.045**
Psychological	.400	**	90.3	1,474	.160**	.411	**	96.4	1,476	.169**	.318	**	53.5	1,476	.101**	.433	**	110.1	1,476	.188**
Biopsychosocial	.441	**	92.6	1,384	.195**	.409	**	77.5	1,386	.167**	.457	**	101.7	1,386	.209**	.364	**	58.7	1,386	.132**
Self-rated global SA	.537	**	196.6	1,484	.289**	.512	**	173.2	1,487	.263**	.278	**	40.8	1,487	.077**	.369	**	76.7	1,487	.136**

Test: Linear regression analyses.

Biomedical Model= Physical health and function (IADL, Chronic Illness, Self-reported health status) and mental (Cognitive Failures Questionnaire, GDS15, Self-reported mental health)

Social Functioning Model= Leisure-time physical, social and productive activities, Social support/network from friends and family

Psychological Model= CD-RISC (Resilience), Pearlin Mastery scale, Life orientation test (Optimism)

Biopsychosocial Model= All the above + spirituality/religiosity (Amount of engagement in such activities)

Global Self-satisfaction= Self-satisfaction at present older adult life stage [single item, scale from 1-10]

SWLS= Satisfaction with Life scale

SF-36 MCS= Short-Form Health Survey Physical Component Score

SF-36 PCS= Short-Form Health Survey Mental Component Score

**p<.001

3

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Table 4. Stepwise regression analyses of significant independent correlates of global and dimensional measures of successful ageing (dependent variables)

Model	Correlates	Unstandardized beta	Standardized beta	t-test	df	p
Biomedical	Age	.659	.242	4.98	1	.000
Social functioning	Education	.510	.221	4.72	1	.000
	Age	.644	.182	3.99	1	.000
	Housing type	.284	.139	2.92	1	.004
	Gender	-.321	-.157	-3.26	1	.001
	Marital status	.258	.127	2.60	1	.010
Psychological	Education	.408	.184	3.87	1	.000
	Housing	.287	.144	3.02	1	.003
	Indian ethnicity	-.494	-.100	-2.14	1	.033
Biopsychosocial	Age	.577	.271	5.55	1	.000
	Education	.166	.132	2.66	1	.008
	Malay ethnicity	.339	.169	3.43	1	.001
	Housing type	.133	.116	2.30	1	.022
Self-rated global SA	Indian Ethnicity	-1.011	-.130	-2.75	1	.006

Test: Stepwise multiple regression analyses, with final models shown.
Candidate predictor variables: Age : 80+(0) vs 65-80 (1); Gender: Female (0) vs males (1); Education: <6 years (0) vs >6 years (1); Housing Type: 3-rm or small (0) vs larger than 3-rm (1); Marital Status: Widowed, single, divorced, separated (0) vs married (1); Ethnicity 1: Chinese (0) Malay (1); Ethnicity2: Chinese (0) Indian (1)

4

Appendix 3. Singapore Study of Successful Ageing Questionnaire (English version).

Singapore Successful Aging Questionnaire

Subject No.: ☐☐☐☐

Name: _____

NRIC: ☐ - ☐☐☐☐☐☐☐ - ☐

Telephone: ☐☐☐☐☐☐☐ / ☐☐☐☐☐☐☐☐

Date of Birth: ☐☐ — ☐☐ — ☐☐☐☐
D D   M M   Y Y Y Y

Residential Address:

_____

_____

S ☐☐☐☐☐☐

Name of Interviewer: _____

Date of Interview: ☐☐ — ☐☐ — ☐☐☐☐
D D   M M   Y Y Y Y

Date of Data-entry: ☐☐ — ☐☐ — ☐☐☐☐
D D   M M   Y Y Y Y

Singapore Successful Aging Questionnaire

Subject No.: [ ][ ][ ][ ]

I. Basic information:

BI1. Race:
1☐ Chinese   2☐ Malay
3☐ Indian   4☐ Others: _____

BI2. Gender:
1☐ Male   2☐ Female

BI3. Marital Status:
1☐ Single, Never married   2☐ Married
3☐ Separated   4☐ Divorced
5☐ Widowed   6☐ Others: _____

BI4. Highest Education Qualification:
1☐ Primary School   2☐ Secondary School
3☐ Polytechnic / Pre-U   4☐ Junior College
5☐ University Graduate   6☐ NIL
7☐ Others: _____

BI5. Total years of studying: _____

BI6. Language of Interview:
1☐ English   2☐ Mandarin
3☐ Malay   ☐ Dialect (Specify):
                                4☐ Hokkien
                                5☐ Cantonese
                                6☐ Teochew
                                7☐ Others:_____

BI7. Title of longest held occupation: _____

BI8. Years served in longest held occupation: _____

BI9.   What is your current employment status? *(Please **check all that apply**)*

    1☐ Employed full-time *(please specify type of work)*: _____

    2☐ Employed part-time *(please specify type of work)*: _____

    3☐ Retired and not currently working

    4☐ Permanently disabled

    5☐ On temporary medical leave

    6☐ Full-time homemaker

    7☐ Unemployed

    8☐ Volunteer *(please specify type of work)*: _____

BI10.   Living arrangement:

    1☐ In the community → alone

    2☐ In the community → with spouse/partner/children

    3☐ In the community → with relatives (siblings)

    4☐ In the community→ with friends

    5☐ Other *(please specify)*: _____

BI11.   Personal income (current, monthly):

    1☐ Less than $500

    2☐ $500 - $999

    3☐ $1,000 - $1,999

    4☐ $2,000 - $3,999

    5☐ $4,000 or more

    6☐ NIL

II. Health and health habits:

WT.   Weigh (kg): _____

HT.   Height (cm): _____

HB1.   Do you suffer from, or has a physician ever told you that you have any of the
following? (***Circle all that apply***)

		Yes	No
a.	Cancer (Specify region):	1	2
b.	Arthritis (Specify type):	1	2
c.	Vision problems that interfere with daily activities	1	2
d.	Hearing difficulties that interfere with daily activities	1	2
e.	Dementia (e.g., Alzheimer's disease, vascular dementia)	1	2
	Specify type: _____		
f.	Diabetes	1	2
g.	High blood pressure	1	2
h.	Heart attack	1	2
i.	Stroke	1	2
j.	Osteoporosis	1	2
k.	Cirrhosis of the liver	1	2
l.	Rheumatoid arthritis	1	2
m.	Traumatic brain injury	1	2
n.	Emphysema	1	2
o.	Cataracts	1	2
p.	Parkinson's disease	1	2
q.	Peptic ulcer	1	2
r.	Chronic Obstructive Pulmonary Disease	1	2
s.	Hypothyroidism	1	2
t.	Hyperthyroidism	1	2

HB2.   How difficult is it for you to move about your home?

1☐ Not Difficult

2☐ Somewhat Difficult

3☐ Very Difficult

4☐ Bed Bound

HB3. Do you use any of the following assistive devices? (**_Circle all that apply_**)

	Yes	No
a. Eye Glasses/Contact Lenses	1	2
b. Hearing Aid	1	2
c. Motorized Wheelchair/Scooter	1	2
d. Walker	1	2
e. Artificial Limb	1	2
f. Cane	1	2
g. Assistance of Others	1	2
h. Wheelchair	1	2
i. None	1	2
j. Other (Describe): _____	1	2

HB4. Would you say your diet is "well-balanced?" (*Please check only **one***)

1☐ All of the time

2☐ Most of the time

3☐ Some of the time

4☐ A little bit of the time

5☐ None of the time

HB5. Please read each item below and decide whether the statement is true or false as it pertains to you personally. (Please **_circle_** the appropriate response)

	Yes	No
a. I have an illness or condition that made me change the kind and/or amount of food that I eat.	1	2
b. I eat fewer than two meals per day.	1	2
c. I eat few fruits or vegetables or milk products.	1	2
d. I have tooth or mouth problems that make it hard for me to eat.	1	2
e. I do not always have enough money to buy the food I need.	1	2
f. I eat alone most of the time.	1	2
g. Without wanting to, I have lost 10 pounds in the last 6 months.	1	2
h. Without wanting to, I have gained 10 pounds in the last 6 months.	1	2
i. I am not always physically able to shop, cook and/or feed myself.	1	2

HB6. Smoking status: (Check only **one**)

1☐ Non-smoker   3☐ Someday smoker

2☐ Former smoker   4☐ Everyday smoker

HB7. Alcohol Use: *(Please check only __one__)*

    1☐ Current regular drinker *(3 or more drinks/day)*

    2☐ Current regular drinker *(2 or fewer drinks/day)*

    3☐ Current infrequent drinker

    4☐ Former infrequent drinker

    5☐ Former regular drinker

    6☐ Lifetime abstainer   *(*If abstainer, skip to #HB11)*

HB8.   *Note: one drink of alcohol is 12 oz. of beer or a wine cooler, 5 oz. of wine, or 1.5oz. of distilled spirits (vodka, rum, etc.).*

  __During the past 30 days__, how often have you had a drink containing alcohol?

    1☐ Never / Not in the last 30 days (**If not in the last 30 days, skip to #HB11*)

    2☐ Once in the last 30 days

    3☐ 2 to 4 times in the last 30 days

    4☐ 2 to 3 times a week

    5☐ 4 or more times a week

HB9.   __During the past 30 days__, how many drinks containing alcohol do you have on a typical day when you are drinking?

    1☐ 1 drink

    2☐ 2 to 4 drinks

    3☐ 5 or 6 drinks

    4☐ 7 to 9 drinks

    5☐ 10 or more drinks

    6☐ NA

HB10.   What is your typical choice of drink?

    1☐ Beer   4☐ Distilled Spirits (vodka, rum, etc.)

    2☐ Red Wine   5☐ Others (specify): _____

    3☐ White Wine   6☐ NA

HB11.   In general, how many different types of prescription medications do you take per day? *(Please __count only those your physician told you to take__)*

    1☐ None

    2☐ 1-2

    3☐ 3-5

    4☐ 6-9

    5☐ 10 or more

HB12.   Do you have any of the following difficulties with sleep?
        (Please **circle all that apply**)

	Yes	No
a. Difficulty falling asleep	1	2
b. Waking up too early	1	2
c. Sleeping during the day	1	2
d. Difficulty staying asleep	1	2
e. Frequent awakening during the night	1	2
f. No difficulties	1	2

HB13.   How many hours of sleep do you get per night (on average)? _____

HB14.   In what ways do you cope with sleep difficulties? (Please **check all that apply**)

	Yes	No
a. Not applicable / No sleep difficulties	1	2
b. Daytime naps	1	2
c. Relaxation techniques (please specify): _____	1	2
d. Sleeping aids such as pills (please specify): _____	1	2
e. Milk	1	2
f. Wine or other alcohol	1	2
g. Praying	1	2
h. Reading	1	2
i. Others(please specify): _____	1	2

HB15.   During **the past 12 months**, how many times have you seen a doctor or other health care

        professional about your own health at a doctor's office, a clinic, or some other place? _____

HB16.   During **the past 12 months**, how many times were you warded overnight at a hospital? _____

HB17.   During **the past 12 months**, how many times did you visit the emergency room? _____

HB18.   How would you rate the overall quality of the healthcare you receive?
        (Please **circle one number**)

             1   2   3   4   5   6   7   8   9   10

        Very Poor ◄───► Excellent

HB19. Do you have any kind of health care coverage, including private health insurance, or government plans such as Medisave or Medishield/ Eldershield or other subsidy schemes?

      1☐ Yes   2☐ No   3☐ Not Sure

HB20. Do you have one person you think of as your personal doctor or health care provider?

      1☐ Yes   2☐ No

HB21. Was there a time in the past 12 months when you needed to see a doctor but could not because of the cost?

      1☐ Yes   2☐ No

HB22. Do you currently have an advance directive (living will, durable power of attorney)?

      1☐ Yes   2☐ No   3☐ Not Sure

HB23. Do you feel threatened or unsafe in your home?

      1☐ Yes   2☐ No   3☐ Not Sure

HB24. How many times have you fallen **during the past year**? _____ *(Total #)*

III. *Attitudes and opinions on the aging process:*

Att1. How old are you? _____ (year)

Att2. How old/ young do you *feel*? _____ **(Please write a specific age (i.e. 75) in year)**

Att3. How do you define "successful aging?"

_____
_____
_____
_____

Att4. Where do you rate yourself in terms of "successful aging?" *(Please **circle one** number)*

        1   2   3   4   5   6   7   8   9   10

      Least successful   Most successful

Att5. Which term do you like the best? *(Please __check only one__)*

    1□ Effective Aging   4□ Robust Aging

    2□ Successful Aging   5□ Productive Aging

    3□ Aging Well   6□ Healthy Aging

    7□ Other: _____

Att6. Biological mother's age, if living: _____   **OR**   Age at death: _____

Att7. Mother's years of education completed: _____

Att8. Biological father's age, if living: _____   **OR**   Age at death: _____

Att9. Father's years of education completed: _____

Att10. How many of your close relatives (i.e., siblings, grandparents) survived to 85 years or older?

    _____

Att11. All of the following have been shown to contribute to successful aging. However, we ask that you please **check a maximum of 5 items from below** that you believe have been the most influential in your own successful aging:

	Yes	No
a. Good genes	1	2
b. Physical exercise	1	2
c. Adapting well to change	1	2
d. Financial stability	1	2
e. Physical health	1	2
f. Work satisfaction	1	2
g. Healthy diet	1	2
h. Positive outlook	1	2
i. Mental activities	1	2
j. Close friends/family	1	2
k. Fulfilling marital/ significant relationships	1	2
l. Other: _____	1	2

Att12. Now, **please write the one most important item** from the list above that has been most influential in your successful aging: _____

Att13.   Please **circle** whether you **AGREE or DISAGREE** with the following statements about yourself:

    a.   Things keep getting worse as I get older.   1☐ Agree / 2☐ Disagree

    b.   I have as much pep as I had last year.   1☐ Agree / 2☐ Disagree

    c.   As I get older, I am less useful.   1☐ Agree / 2☐ Disagree

    d.   As I get older, things are better than I thought they would be.   1☐ Agree / 2☐ Disagree

    e.   I am as happy now as when I was younger.   1☐ Agree / 2☐ Disagree

Att14.   Please read the following five statements and rate your level of agreement with each statement: *(Please **circle one number** for each)*

		Not at all True	Moderately True →					Absolutely True
a.	In most ways my life is close to my ideal	1	2	3	4	5	6	7
b.	The conditions of my life are excellent	1	2	3	4	5	6	7
c.	I am satisfied with my life	1	2	3	4	5	6	7
d.	So far I have gotten the important things I want in life	1	2	3	4	5	6	7
e.	If I could live my life over, I would change almost nothing	1	2	3	4	5	6	7

	Not at All	Moderately True →								Very much
Att15. Do you like yourself?	1	2	3	4	5	6	7	8	9	10

Att16.   **Choose which of the following** statements is the most important to you. Please place a check mark in the corresponding box. *(Please **check only one**)*

    1☐ I want to live as long as possible regardless of the quality of life that I experience.

    2☐ I want to preserve a good quality of life even if this means that I may not live as long.

Att17.   Within the **past 30 days**, have you felt emotionally upset (e.g., angry, sad, or frustrated), as a result of how you were treated based on your age?

    1☐ Yes   2☐ No   3☐ Not Sure

IV. Satisfaction with different times and aspects of your life. (Please **circle one number** for each response).

Sat1. How satisfied were you during the following times in your life:

	Not at all satisfied	←								→	Very satisfied
a. Childhood (≤12 yrs)	1	2	3	4	5	6	7	8	9		10
b. Adolescence (13 - 19 yrs)	1	2	3	4	5	6	7	8	9		10
c. Young adulthood (20 - 45 yrs)	1	2	3	4	5	6	7	8	9		10
d. Middle Adulthood (46 – 64 yrs)	1	2	3	4	5	6	7	8	9		10
e. Older Adulthood (65+ yrs)	1	2	3	4	5	6	7	8	9		10

Sat2. Now, please **choose**, from the choices above (a, b, c, d, or e), the **single** best time of your life:

_____

In general, how satisfied are you with your:	Not at all satisfied	←								→	Very satisfied
Sat3 **Relationships with friends and relatives**?	1	2	3	4	5	6	7	8	9		10
Sat4 **Mental (thinking) abilities**?	1	2	3	4	5	6	7	8	9		10
Sat5 **Finances**?	1	2	3	4	5	6	7	8	9		10

V. The following questions ask about the activities you participate in:

ACT1. Considering a *7-day period* (one week), how many times on average do you do the following kinds of exercise for more than 15 minutes during your free time? *(Please **write the appropriate number on each line**)*

Activity	**Times Per Week**
a. **Strenuous Exercise** (Heart Beats Rapidly) (e.g., basketball, judo, roller skating, running, jogging, hockey, football, soccer, squash, swimming, vigorous long-distance bicycling)	_____
b. **Moderate Exercise** (Not Exhausting) (e.g., fast walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, popular and folk dancing)	_____
c. **Mild Exercise** (Minimal Effort) (e.g., yoga, fishing, bowling, golf, easy walking)	_____

ACT2. Considering a **7-day period** (one week), during your leisure time, how often do you engage in any regular activity long enough to work up a sweat (heart beats rapidly)?

1☐ Often   2☐ Sometimes   3☐ Never/Rarely

ACT3. How often do you engage in the following activities? *(**Circle the appropriate response**)*

	Never did this activity	Not in the past year	Less than once per month	1 to 4 times per month	5 or more times per month	Every day
a. Playing chess, bridge, or other knowledge games	1	2	3	4	5	6
b. Playing board games of skill or chance	1	2	3	4	5	6
c. Solving crossword puzzles or acrostics	1	2	3	4	5	6
d. Watching TV or listening to the radio	1	2	3	4	5	6
e. Listening to music	1	2	3	4	5	6
f. Gardening	1	2	3	4	5	6
g. Reading the newspaper	1	2	3	4	5	6
h. Reading books or stories	1	2	3	4	5	6
i. Writing letters	1	2	3	4	5	6
j. Talking on the phone/visiting	1	2	3	4	5	6
k. Doing original art/craft work	1	2	3	4	5	6
l. Doing art or craft kits/patterns	1	2	3	4	5	6

	Never did this activity	Not in the past year	Less than once per month	1 to 4 times per month	5 or more times per month	Every day
m. Making complex home repairs	1	2	3	4	5	6
n. Making simple home repairs	1	2	3	4	5	6
o. Preparing meals for new recipes	1	2	3	4	5	6
p. Cooking familiar recipes	1	2	3	4	5	6
q. Leading discussions	1	2	3	4	5	6
r. Taking a course	1	2	3	4	5	6
s. Managing of investments	1	2	3	4	5	6
t. Doing routine financial work	1	2	3	4	5	6
u. Walking/driving in unfamiliar places	1	2	3	4	5	6
v. Walking/driving in familiar places	1	2	3	4	5	6
w. Going to social clubs	1	2	3	4	5	6
x. Attending church/religious activities	1	2	3	4	5	6
y. Shopping	1	2	3	4	5	6
z. Others: _____						

ACT4. **Over the past year**, how often have you engaged in these activities? *(**Circle the appropriate response**)*

	Never did this activity	Not in the past year	Less than once per month	1 to 4 times per month	5 or more times per month	Every day
a. Computer activities	1	2	3	4	5	6
b. Travel	1	2	3	4	5	6
c. Playing sports	1	2	3	4	5	6
d. Attending lectures/presentations	1	2	3	4	5	6
e. Visiting friends or neighbors	1	2	3	4	5	6
f. Visiting family or relatives	1	2	3	4	5	6
g. Child/grandchild care	1	2	3	4	5	6
h. Other caregiver activities	1	2	3	4	5	6
i. Paid work	1	2	3	4	5	6
j. Volunteer work	1	2	3	4	5	6
k. Laundry	1	2	3	4	5	6
l. Additional housework	1	2	3	4	5	6
m. Other:	1	2	3	4	5	6

ACT5. For the following questions, please circle the appropriate response:

	Never	Rarely	Sometimes	Often	Always
a. When you go on a trip away from your home, how often do you purposely **limit** the amount you have to walk?	1	2	3	4	5
b. How often do you **avoid** a situation in which you have to walk across a busy street?	1	2	3	4	5
c. When you go on a trip away from your home, how often do you **avoid** going when it is raining?	1	2	3	4	5
d. How often do you purposely **avoid** a situation in which you would have to walk on an uneven surface?	1	2	3	4	5
e. How often do you limit the number, or weight, of items you carry?	1	2	3	4	5

ACT6. Think about the **past 4 weeks**. The following is a list of various activities you might have done.

(i) Step 1: Number of times each week. For each activity, write on the line provided **how many times each week**, on average, you did that activity. If you did an activity **less than once a week**, please write a zero "0" on the line provided.

(ii) Step 2: Total time, on average, each week. If you did the activity at least once a week, **circle** appropriate response representing how much **total time (hour)**, on average, you spent doing it **each week**.

Walking and Jogging (Including Treadmill)	Total (If none, write "0")	<1 hr a week	1 - 2½ hrs a week	3 - 4½ hrs a week	5 - 6½ hrs a Week	7 - 8½ hrs a week	≥ 9 hrs a Week
a. Walk **leisurely** for exercise or pleasure	____ times/ week	1	2	3	4	5	6
b. Walk **to do errands** (e.g., to/from a store – **count walk time only**)	____ times/ week	1	2	3	4	5	6
c. Walk **fast or briskly** for exercise (do **not** count walking leisurely or uphill)	____ times/ week	1	2	3	4	5	6
d. Jog or run	____ times/ week	1	2	3	4	5	6
e. Ride a bicycle or stationary cycle using **legs only**	____ times/ week	1	2	3	4	5	6

Other Types of Exercise	Total (If none, write "0")	<1 hr a week	1 - 2½ hrs a week	3 - 4½ hrs a week	5 - 6½ hrs a Week	7 - 8½ hrs a week	≥ 9 hrs a Week
f. Do aerobic machines involving **arms and legs** (e.g., rowing or cross-country ski machines)	____ times/ week	1	2	3	4	5	6
g. Do stair or step machine	____ times/ week	1	2	3	4	5	6
h. Swim gently	____ times/ week	1	2	3	4	5	6
i. Swim moderately or fast	____ times/ week	1	2	3	4	5	6
j. Do water exercises (do **not** count other swimming)	____ times/ week	1	2	3	4	5	6
k. Do stretching or flexibility exercises (do **not** include yoga or Tai-chi)	____ times/ week	1	2	3	4	5	6
l. Do yoga or Tai-chi	____ times/ week	1	2	3	4	5	6
m. Do aerobics or aerobic dancing	____ times/ week	1	2	3	4	5	6
n. Do moderate to heavy strength training (e.g., hand-held weights of **more than 5 lbs.**, weight machines, or push-ups	____ times/ week	1	2	3	4	5	6
o. Do light strength training (e.g., hand-held weights of **5 lbs. or less** or elastic bands)	____ times/ week	1	2	3	4	5	6
p. Do general conditioning exercises, e.g., light calisthenics or chair exercises (do **not** count strength training)	____ times/ week	1	2	3	4	5	6
q. Play basketball, soccer, or racquetball (do **not** count time on sidelines)	____ times/ week	1	2	3	4	5	6
r. Do other types of physical activity not previously mentioned (please specify):_____	____ times/ week	1	2	3	4	5	6

Modified from UCSD-Successful Aging Questionnaire   *Version 3 Dated 24 August 2007*

ACT7. Do you **currently** drive a car, truck or motorcycle, etc . . .?   1☐ Yes   2☐ No

   A. ***If you answered no***, did you ever drive?   1☐ Yes   2☐ No

   B. If you stopped driving, at what age did you stop and why?
      Age Stopped (yrs): _____

Reason: *(Please underline check all that apply)*

	Yes	No	NA
a. Vision Difficulties	1	2	3
b. Safety	1	2	3
c. Financial Reasons	1	2	3
d. Do not need to drive	1	2	3
e. Family/Healthcare Provider Recommendation	1	2	3
f. General Health	1	2	3
g. Discomfort	1	2	3
h. No Access to Vehicle	1	2	3
i. Loss of Driver's License	1	2	3
j. Over age-limit	1	2	3
k. Retired from job	1	2	3
l. Others:_____			

VI. Social relationships:

Soc1. How many children do you have?
      1☐ None   2☐ 1   3☐ 2   4☐ 3   5☐ 4 +

Soc2. If you stated you have children, how many of your children do you feel close to? _____

Soc3. How many **friends** do you have – that is, people you feel at ease with, can talk to about private matters, and call on for help? _____

Soc4. How many **relatives** do you feel at ease with, talk to about private matters, and/or call on for help? _____

Soc5. For each question below, please **circle** the appropriate response.

How Often:	Never	A Little of the Time	Sometimes	Frequently
a. Do your spouse, children, close friends and/or relatives make you feel loved and cared for?	0	1	2	3
b. Are your spouse, children, close friends and/or relatives willing to listen when you need to talk about your worries or problems?	0	1	2	3
c. Do your spouse, children, close friends and/or relatives help with daily tasks like shopping, giving you a ride, or helping you with household tasks?	0	1	2	3
d. Do your spouse, children, close friends and/or relatives give you advice or information about medical, financial, or family problems?	0	1	2	3
e. Do your spouse, children, close friends and/or relatives make too many demands on you?	0	1	2	3
f. Are your spouse, children, close friends and/or relatives critical of what you do?	0	1	2	3
g. Do you feel lonely?	0	1	2	3

Soc6. The following are four general relationship styles that people often report. Please **place a checkmark** next to the letter corresponding to **the style that best describes you** or is closest to the way you are.

1☐   A.   It is easy for me to become emotionally close to others. I am comfortable depending on them and having them depend on me. I don't worry about being alone or having others not accept me.

2☐   B.   I am uncomfortable getting close to others. I want emotionally close relationships, but I find it difficult to trust others completely, or to depend on them. I worry that I will be hurt if I allow myself to become too close to others.

3☐   C.   I want to be completely emotionally intimate with others, but I often find that others are reluctant to get as close as I would like. I am uncomfortable being without close relationships, but I sometimes worry that others don't value me as much as I value them.

4☐   D.   I am comfortable without close emotional relationships. It is very important to me to feel independent and self-sufficient, and I prefer not to depend on others or have others depend on me.

Soc7. Now please rate **each of the relationship styles above** to indicate how well or poorly each
description corresponds to your general relationship style. *(Please **circle one number for each**)*

		Not at all Like Me	Neutral/Mixed					Very Much Like Me
a.	Style A	1	2	3	4	5	6	7
b.	Style B	1	2	3	4	5	6	7
c.	Style C	1	2	3	4	5	6	7
d.	Style D	1	2	3	4	5	6	7

Soc8. In the past year, have you been a caregiver for a spouse, friend or family member who is sick or
unable to care for themselves?

        1☐ Yes   2☐ No

    a. If you answered yes, has this been stressful for you?

        1☐ Yes   2☐ No

Soc9. Do you have any pets?

        1☐ Yes   2☐ No

VII. Handling things in daily life:

To what extent do you agree or disagree with the following statements about yourself? For each
statement, please **circle the appropriate response**.

		Strongly Agree	Agree	Disagree	Strongly Disagree
DL1.	There is really no way I can solve some of the problems I have.	1	2	3	4
DL2.	Sometimes I feel that I'm being pushed around in life.	1	2	3	4
DL3.	I have little control over the things that happen to me.	1	2	3	4
DL4.	I can do just about anything I really set my mind to do.	1	2	3	4
DL5.	I often feel helpless in dealing with the problems of life.	1	2	3	4
DL6.	What happens to me in the future mostly depends on me.	1	2	3	4
DL7.	There is little I can do to change many of the important things in my life.	1	2	3	4

VIII. *Your outlook on life:*

	Not True At All	Rarely True	Sometimes True	Often True	True Nearly All of the Time
OL1. I am a perfectionistic person.	1	2	3	4	5
OL2. I am a good organizer.	1	2	3	4	5

IX. *Think of how things have been going this month.*

In the past month,	Strongly Disagree	Disagree	Agree	Strongly Agree
MTH1. **Keeping healthy**: I've been feeling this month that this depends on things that I can do.	1	2	3	4
MTH2. **Getting transportation when I want it**: This month I've been feeling that it's up to me to do this.	1	2	3	4
MTH3. **Having good relationships with my family**: This month I've been feeling that I cannot have the relationships with my family that I want.	1	2	3	4
MTH4. **My financial situation**: This month I've been feeling that I could make it better if I wanted to.	1	2	3	4
MTH5. **Safety**: This month I've been feeling that there are things I could do to make myself feel safe.	1	2	3	4
MTH6. **Having good relationships with my friends**: This month I've been feeling that I cannot have the relationships that I want with my friends.	1	2	3	4
MTH7. **My living arrangements**: This month I've been feeling that I do not have enough control over how good they are.	1	2	3	4
MTH8. **Being productive**: I've been feeling this month that I cannot be as productive as I want to.	1	2	3	4

MTH9. The above questions have asked about your life in the past month. Has your life been unusually good or bad **during this time**?

1☐ Yes   2☐ No

X. Questions about yourself. Try not to let an answer to one question affect your answer to other questions

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
SL1.	In unclear times, I usually expect the best	1	2	3	4	5
SL2.	If something can go wrong for me, it will	1	2	3	4	5
SL3.	I'm always hopeful about my future	1	2	3	4	5
SL4.	I hardly ever expect things to go my way	1	2	3	4	5
SL5.	I rarely count on good things happening to me	1	2	3	4	5
SL6.	Overall, I expect more good things to happen to me than bad	1	2	3	4	5

XI. Treatment history:

TH1. Have you ever been diagnosed with or treated for a mental or emotional problem, such as depression or anxiety?

         1☐ No   2☐ Yes

a.   If yes, did this problem limit your ability to function in your job, school, family, or social life?

         1☐ No   2☐ Not too much   3☐ Moderately   4☐ Very much
         5☐ NA

b.   What was the diagnosis? _____

TH2. Have you ever been in treatment with a psychiatrist, psychologist, or other mental health professional?

         1☐ No   2☐ Yes

TH3. Have you ever been prescribed medication for a mental or emotional problem?

         1☐ No   2☐ Yes

TH4. Have you ever been hospitalized for a mental or emotional problem?

         1☐ No   2☐ Yes

XII. Spiritual activities. Please state how often you engage in the following by circling the appropriate response below:

	Never	Once a Year or Less	A Few Times a Year	A Few Times a Month	Once a Week	More than Once a Week
SA1. How often do you attend church, synagogue, or other religious meetings?	0	1	2	3	4	5

	Rarely or Never					More than Once a Day
SA2. How often do you spend time in private spiritual activities, such as prayer or meditation?	0	1	2	3	4	5

How true are the following statements for you?	Definitely Not True					Definitely True
SA3. In my life, I experience the presence of the Divine	0	1	2	3	4	5
SA4. My spiritual beliefs are what really lie behind my whole approach to life	0	1	2	3	4	5
SA5. I try hard to carry my spiritual beliefs over into all other dealings in life	0	1	2	3	4	5

XIII. Views about health:

VH1. In general, would you say your health is:

    1☐ Poor   2☐ Fair   3☐ Good   4☐ Very Good   5☐ Excellent

VH2. **Compared to one year ago**, how would you rate your health in general *now*?

    1☐ Much better now than one year ago

    2☐ Somewhat better now than one year ago

    3☐ About the same as one year ago

    4☐ Somewhat worse now than one year ago

    5☐ Much worse than one year ago

VH3. The following items are about activities you might do during a typical day. Does **your health now limit you** in these activities? If so, how much:

	Yes, Limited a Lot	Yes, Limited a Little	No, Not Limited at All
a. Vigorous activities (i.e., running, lifting heavy objects, strenuous sports)	1	2	3
b. Moderate activities (i.e., moving a table, pushing vacuum cleaner, bowling, playing golf)	1	2	3
c. Lifting or carrying groceries	1	2	3
d. Climbing several flights of stairs	1	2	3
e. Climbing one flight of stairs	1	2	3
f. Bending, kneeling, or stooping	1	2	3
g. Walking more than a mile	1	2	3
h. Walking several blocks	1	2	3
i. Walking one block	1	2	3
j. Bathing or dressing yourself	1	2	3

VH4. During the **past 4 weeks**, have you had any of the following problems with your work or other regular daily activities as **a result of your physical health**?

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
a. Cut down on the amount of time you spent on work or other activities	1	2	3	4	5
b. Accomplished less than you would like	1	2	3	4	5
c. Were limited in the kind of work or other activities you could undertake	1	2	3	4	5
d. Had difficulty performing work or other activities (i.e., it took extra effort)	1	2	3	4	5

VH5. During the ***past 4 weeks***, have you had any of the following problems with your work or other regular daily activities ***as a result of any emotional problems*** (such as feeling depressed or anxious)?

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
a. Cut down on the amount of time you spent on work or other activities	1	2	3	4	5
b. Accomplished less than you would like	1	2	3	4	5
c. Didn't do work or other activities less carefully than usual	1	2	3	4	5

During the ***past 4 weeks***:	Not at all	A little bit	Moderately	Quite a bit	Extremely
VH6 To what extent have your physical health or emotional problems interfered with your normal social activities with family, friends, neighbors, or groups?	1	2	3	4	5
VH7 How much did **pain** interfere with your normal work (including both work outside the home and housework)?	1	2	3	4	5

	None	Very mild	Mild	Moderate	Severe	Very Severe
VH8 How much ***bodily*** pain have you had during the ***past 4 weeks***?	1	2	3	4	5	6

VH9   These questions ask about how you feel and how things have been with you *during the past 4 weeks*. For each question, please <u>give the one answer</u> that comes closest to the way you have been feeling by <u>circling the appropriate response</u>.

How much of the time during the *past 4 weeks*...	All of the time	Most of the time	Some of the time	A little of the time	None of the time
a. did you feel full of pep?	1	2	3	4	5
b. have you been a very nervous person?	1	2	3	4	5
c. have you felt so down in the dumps that nothing could cheer you up?	1	2	3	4	5
d. have you felt calm and peaceful?	1	2	3	4	5
e. did you have a lot of energy?	1	2	3	4	5
f. have you felt downhearted and blue?	1	2	3	4	5
g. did you feel worn out?	1	2	3	4	5
h. have you been a happy person?	1	2	3	4	5
i. have you felt tired?	1	2	3	4	5

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
VH10 During the *past month*, how much of the time has your *physical health* or *emotional problems* interfered with your social activities (like visiting with friends, relatives, etc.)?	1	2	3	4	5

VH11. How **TRUE** or **FALSE** are *each* of the following statements for you? Please <u>circle the appropriate response</u>.

	Definitely True	Mostly True	Mostly False	Definitely False	Don't Know
a. I seem to get sick a little easier than other people.	1	2	3	4	5
b. I am as healthy as anybody I know.	1	2	3	4	5
c. I expect my health to get worse.	1	2	3	4	5
d. My health is excellent.	1	2	3	4	5
e. I worry about losing my memory.	1	2	3	4	5
f. I am aging well.	1	2	3	4	5

VH 12.   How does your current mental alertness compare to when you were younger?
(Please **circle one number**)

1	2	3	4	5	6	7	8	9

Much Less   Same   Much More
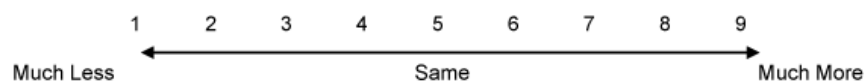
VH13.   Comparing yourself with people of your own age, would you say your **mental health** is:

1☐ Poor
2☐ Fair
3☐ Good
4☐ Very Good
5☐ Excellent

XIV. *Your outlook on life:*

		Not True At All	Rarely True	Sometimes True	Often True	True Nearly All of the Time
OL3.	I am able to adapt to change	1	2	3	4	5
OL4.	I have close and secure relationships	1	2	3	4	5
OL5.	I believe that sometimes fate or God can help me	1	2	3	4	5
OL6.	I can deal with whatever comes my way	1	2	3	4	5
OL7.	Past success gives me confidence for new challenges	1	2	3	4	5
OL8.	I see the humorous side of things	1	2	3	4	5
OL9.	I believe coping with stress strengthens me	1	2	3	4	5
OL10.	I tend to bounce back after illness or hardship	1	2	3	4	5
OL11.	I believe things happen for a reason	1	2	3	4	5
OL12.	I give my best effort no matter what	1	2	3	4	5
OL13.	I believe I can achieve my goals	1	2	3	4	5
OL14.	When things look hopeless, I don't give up	1	2	3	4	5
OL15.	I know where to turn for help	1	2	3	4	5
OL16.	Under pressure, I can focus and think clearly	1	2	3	4	5
OL17.	I prefer to take the lead in problem solving	1	2	3	4	5
OL18.	I am not easily discouraged by failure	1	2	3	4	5
OL19.	I think of myself as a strong person	1	2	3	4	5
OL20.	I make unpopular or difficult decisions	1	2	3	4	5
OL21.	I can handle unpleasant feelings	1	2	3	4	5
OL22.	I have to act on a hunch	1	2	3	4	5
OL23.	I have a strong sense of purpose	1	2	3	4	5
OL24.	I am in control of my life	1	2	3	4	5
OL25.	I like challenges	1	2	3	4	5
OL26.	I work to attain my goals	1	2	3	4	5
OL27.	I take pride in my achievements	1	2	3	4	5

<u>XV. Think of this ladder as representing where people stand in their communities.</u>

LD1. People define community in different ways; please define it in whatever way is most meaningful to you. At the top of the ladder are the people who have the highest standing in their community. At the bottom are the people who have the lowest standing in their community.

Where would you place yourself on this ladder? Please ***circle the number*** next to the rung where you think you stand at this time in your life, relative to other people in your community.
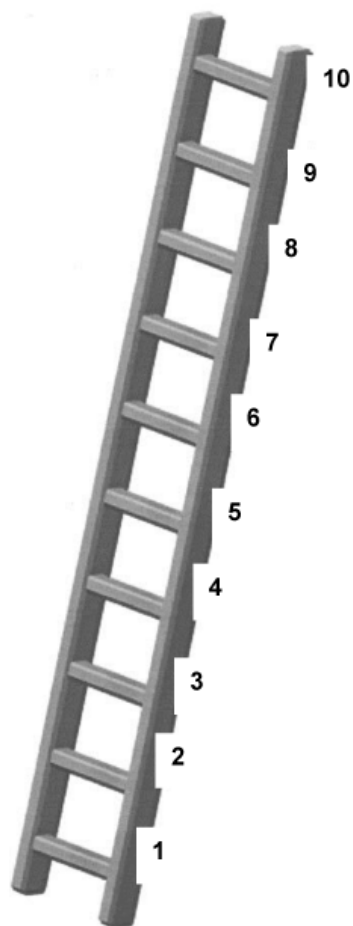
XVI. Think of this ladder as representing where people stand in SINGAPORE.

LD2. At the top of the ladder are the people who are the best off – those who have the most money, the most education and the most respected jobs. At the bottom are the people who are the worst off – who have the least money, least education, and the least respected jobs or no job. The higher up you are on this ladder, the closer you are to the people at the very top.

Where would you place yourself on this ladder?

Please _**circle the number**_ **next to the rung** where you think you stand at this time in your life, relative to other people in Singapore.

10
9
8
7
6
5
4
3
2
1
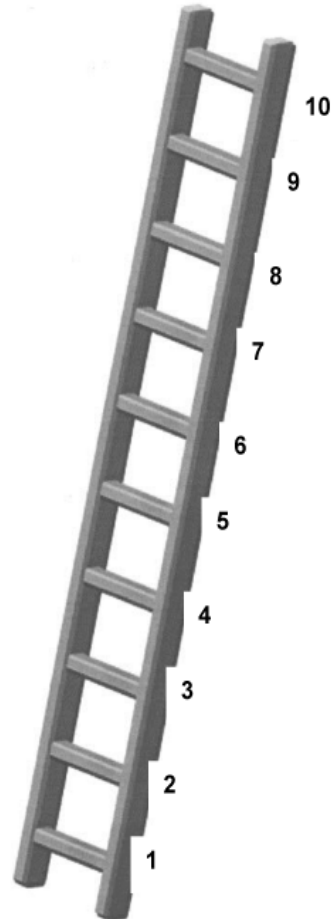
*XVII. **Thinking abilities**. The following questions are about minor mistakes, which everyone makes from time to time, but some of which happen more often than others. We want to know how often these things have happened to you in the **LAST SIX MONTHS**. Please **circle** the appropriate number.*

		Never	Very rarely	Occasionally	Quite often	Very often
TA1	Do you need to re-read instructions several times?	1	2	3	4	5
TA2	Do you find you forget why you went from one part of the house to the other?	1	2	3	4	5
TA3	Do you find you confuse right and left when giving directions?	1	2	3	4	5
TA4	Do you find you forget whether you've turned off a light or a fire or locked the door?	1	2	3	4	5
TA5	Do you forget to listen to people's names when you are meeting them?	1	2	3	4	5
TA6	Do you say something and realize afterwards that it might be taken as insulting?	1	2	3	4	5
TA7	Do you lose your temper and regret it?	1	2	3	4	5
TA8	Do you leave important phone calls, e-mails, or letters unanswered for days?	1	2	3	4	5
TA9	Do you find you forget which way to turn on a road you know well but rarely use?	1	2	3	4	5
TA10	Do you fail to find what you want in a supermarket (although it's there)?	1	2	3	4	5
TA11	Do you find yourself wondering whether you've used a word correctly?	1	2	3	4	5
TA12	Do you have trouble making up your mind?	1	2	3	4	5
TA13	Do you forget appointments?	1	2	3	4	5
TA14	Do you forget where you put something like a newspaper or a book?	1	2	3	4	5
TA15	Do you find you accidentally throw away the thing you want and keep what you meant to throw away - as in the example of throwing away today's newspaper and keeping yesterday's?	1	2	3	4	5
TA16	Do you start doing one thing and get distracted into doing something else (unintentionally)?	1	2	3	4	5
TA17	Do you find you can't quite remember something although it's on the tip of your tongue?	1	2	3	4	5
TA18	Do you forget what you came to the shop to buy?	1	2	3	4	5
TA19	Do you drop things?	1	2	3	4	5
TA20	Do you find you can't think of anything to say?	1	2	3	4	5

Modified from UCSD-Successful Aging Questionnaire   *Version 3 Dated 24 August 2007*

XVIII. Cognitive Screening.

XVIII. Using a pencil, please **fill out the answers to ALL questions** that you can on the following 2 pages **WITHOUT** the assistance of others. We recognize that some questions may be difficult and that you could probably figure out the answers if you were allowed to ask someone else, but we want to see how **YOU** are performing. Also, please do not use things such as a calculator, clock on the wall, calendar, computer, or encyclopedia to help you answer these questions. Just do the best that you can. Please try to complete the questions in one sitting. THANK YOU!

CS1. Who is the:

    a. Prime Minister of Singapore? _____

    b. Previous prime minister? _____

    c. President of Singapore? _____

CS2. What country are we in? _____

CS3. Copy this sentence in your own writing:

      This is a lovely day in the month of May.

      →

_____

CS4. Copy the figure:	CS5. Draw a Person:

CS6. Add the following numbers:

$112.59
  37.64
   5.97
  82.50
_____

           Version 3 Dated 24 August 2007

CS7.   Without looking at a clock or watch, fill in the **numerals** on this clock, and set the **hands** to **10 past 11**:

CS8.   Copy this figure:
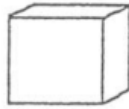
CS9.   The Mentor Minister of Singapore is: _____

CS10. One of the MPs of your neighborhood is: _____

*XIX. Life events. Please try to **think back over the past year** to remember if any of these things happened and **circle the answer that seems best**.*

Over the past year:	NO	YES, and it upset me:		
		Not too much	Moderately (Medium)	Very much
LE1. Did your spouse or partner die?	0	1	2	3
LE2. Did a close friend or family member die or have a serious illness (other than your spouse or partner)?	0	1	2	3
LE3. Did you have any major problems with money?	0	1	2	3
LE4. Did you have a divorce or break-up with a spouse or partner?	0	1	2	3
LE5. Did a family member or close friend have a divorce or break-up?	0	1	2	3
LE6. Did you have a major conflict with children or grandchildren?	0	1	2	3
LE7. Did you have any major accidents, disasters, muggings, unwanted sexual experiences, robberies, or similar events?	0	1	2	3
LE8. Did you or a family member or close friend lose their job or retire?	0	1	2	3
LE9. Were you physically abused by being hit, slapped, pushed, shoved, punched or threatened with a weapon by a family member of close friend?	0	1	2	3
LE10. Were you verbally abused by being made fun of, severely criticized, told you were a stupid or worthless person, or threatened with harm to yourself, your possessions, or your pets, by a family member or close friend?	0	1	2	3
LE11. Did a pet die?	0	1	2	3

XX. Our sincere apology if the following questions asking your opinions on the aging process and sexual life are a bit too sensitive. **Please circle one number**.

	Never	← →	All of the time
AP1. To what extent you think about death	1	2 3 4 5 6 7 8 9	10

	Not at all	← →	Very much
AP2. To what extent you fear of death	1	2 3 4 5 6 7 8 9	10

AP3. How many more years do you think you will live? _____
(*Please write a specific number* (e.g., 10))

AP4. How many more years would you like to live? _____
(*Please write a specific number* (e.g., 10))

AP5. Approximately how often do you think about your age?
1☐ Never
2☐ Once a year
3☐ Once a month
4☐ Once a week
5☐ Once a day
6☐ Once an hour
7☐ Constantly

SAX1. How often do you engage in sexual activity?
1☐ Weekly or more than once a week
2☐ 1-3 times a month
3☐ Less than once a month
4☐ Never in the past year
5☐ Does not wish to answer
6☐ NA

SAX2. How satisfied are you with your sex life today?
1☐ Very Satisfied
2☐ Somewhat
3☐ Not too satisfied
4☐ Not at all
5☐ Does not wish to answer

SAX3. Do you think sex is more enjoyable for people your age than for younger people?

1☐ More Enjoyable

2☐ About the Same

3☐ Less Enjoyable

4☐ Does not wish to answer

SAX4. How frequently do you or your partner have problems with sexual arousal or performance?

1☐ Often

2☐ Occasionally

3☐ Seldom

4☐ Never

5☐ NA

6☐ Does not wish to answer

XX. FEEDBACK FROM YOU

FB1. WHAT IMPORTANT QUESTIONS SHOULD WE HAVE ASKED THAT WE DID NOT?

_____

_____

_____

FB2. YOUR RESPONSE TO THIS IMPORTANT QUESTION(S):

_____

_____

_____

FB3. DO YOU HAVE ANY COMMENTS AND/OR SUGGESTIONS ABOUT THIS QUESTIONNAIRE?

_____

_____

_____

FB4. APPROXIMATELY HOW LONG (IN MINUTES) DID IT TAKE YOU TO COMPLETE THIS SURVEY FROM BEGINNING TO END? _____

THANK YOU VERY MUCH!

Appendix 4. Demographic questionnaire for focus group study

Successful Ageing: Characterizing its Multiple Dimensions in Singaporean Seniors and the Development and Validation of a Measurement Scale for Health Care and Promotion Programmes.

(Stage 1: Focus Group Research)

Subject No.: ☐☐☐☐

Name: _____

Telephone: ☐☐☐☐☐☐☐☐ / ☐☐☐☐☐☐☐☐

Date of Birth: ☐☐ — ☐☐ — ☐☐☐☐
          D D   M M   Y Y Y Y

Residential Address:

_____

_____

S ☐☐☐☐☐

Date: ☐☐ — ☐☐ — ☐☐☐☐
      D D   M M   Y Y Y Y

I. Basic information:

BI1. Race:
    1☐ Chinese   2☐ Malay
    3☐ Indian   4☐ Others: _____

BI2. Religion:
    1☐ Buddhism   2☐ Taoism
    3☐ Hinduism   4☐ Islam
    5☐ Christianity   6☐ Catholicism
    7☐ Others: _____

BI3. Gender:
    1☐ Male   2☐ Female

BI4. Marital Status:
    1☐ Single, Never married   2☐ Married
    3☐ Separated   4☐ Divorced
    5☐ Widowed   6☐ Others: _____

BI5. Highest Education Qualification:
    1☐ Primary School   2☐ Secondary School
    3☐ Polytechnic / Pre-U   4☐ Junior College
    5☐ University Graduate   6☐ NIL
    7☐ Others: _____

BI6. Language of Interview:
    1☐ English   2☐ Mandarin

BI7. Title of longest held occupation: _____

BI8. Years served in longest held occupation: _____

BI9. What is your current employment status? *(Please **check all that apply**)*

    1☐ Employed full-time *(**please specify type of work**)*: _____

    2☐ Employed part-time *(**please specify type of work**)*: _____

    3☐ Retired and not currently working

    4☐ Permanently disabled

    5☐ On temporary medical leave

    6☐ Full-time homemaker

    7☐ Unemployed

    8☐ Volunteer *(**please specify type of work**)*: _____

BI10. Living arrangement:

1☐ In the community → alone

2☐ In the community → with spouse/partner/children

3☐ In the community → with relatives (siblings)

4☐ In the community→ with friends

5☐ Other *(please specify)*: _____

BI11. Personal income (current, monthly):

1☐ Less than $500

2☐ $500 - $999

3☐ $1,000 - $1,999

4☐ $2,000 - $3,999

5☐ $4,000 or more

6☐ NIL

If you have any comments or feedback about this focus group discussion, please write them down in the space below:

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Appendix 5. Protocol guide with probe questions for focus group study.

Successful Ageing: Characterizing its Multiple Dimensions in Singaporean Seniors and the Development and Validation of a Measurement Scale for Health Care and Promotion Programmes.

Target Audience: Singaporeans aged 60 and above.
Topics: Subjective views on what it means to age well or successfully.

Part 1: PRE-INTRODUCTION (before formal introduction)

A. Arrive and set up room for focus group about 30 mins prior.

B. Obtain consent from participants. Ask participants to take refreshments and mingle.

C. Start when all participants have arrived or wait 10 mins max.

Part 2: INTRODUCTION (Start recording)

A. Thanks and appreciation for taking time to attend.

   a. Introduce yourself.

     → "Thank you for coming today. We are _____ & _____ from the Gerontological Research Programme at NUS."

B. Objective of focus group.

     → "We are doing a research project on aging well and so would like to know your personal views on what you think contribute to a high quality of life at age 60 and above. So far, the concept of successful aging has been defined by researchers and we would like to define aging from the local seniors' point of view. We will tape-record this discussion but everything will be kept confidential as there will be no identifying information associated with your response. To help us, please feel free to speak your mind as there are no wrong answer.

C. Any questions before we start?

D. Begin questioning.

Part 3: BEGIN TOPIC DISCUSSION

**Main Question 1.** **What do you think are the important things that contribute to ageing well?**
- What does it mean to you to age well?
- What are important things for you in life at this stage of life?
- What are your views on aging successfully?
- What do you think is necessary for you to age well?
- What makes you happy now?
- What enables you to have a high quality of life?

Probe Question. **In your community, what is the ideal life after 60s year of age?**

Probe Question. **How would you like to age?**
    a. Any role model (public/private figure)?
    a. Reason

Probe Question. **What kinds of things engage you the most?**

Probe Question. **What aspects of life give you the greatest sense of meaning?**

Probe Question. **What do you find most pleasurable in your life?**

Note: If any of the following main domains are mentioned or elaborated, continue to probe with the following:

(1) Physical Health
    a. How does your physical health impact your quality of life?
    b. What aspects of physical health are most important to you?

(2) Cognitive: Memory / Attention / Planning / Speed / Learning
    a. How does your memory ability affect your life currently?
    b. What other thinking abilities have changed?
        i. How do they affect your life?
    c. What role does learning play in your life?
        i. How and what type of learning.

(3) Financial Stability and Security
    a. How do finances impact your quality of life?
    b. Is it possible to have a high quality of life without a lot money?

(4) Spirituality and Religion
    a. Is spirituality or religion important for you to age well?
        i. How does it or does not contribute to your well-being?

(5) Social Activities

a. What kind of activities do you participate in?
    i. Zoom in on the social activities.
    ii. How often and with whom?
    iii. Why do you do it?

b. How do they improve your quality of life?

(6) Personal Activities: Individual hobbies
a. What kind of activities do you participate in?
    i. Zoom in on personal hobbies.
b. How often?
c. Why do you do it?

(7) Social Support
a. Do you feel like a part of society?
b. Is having close relationship with others important to you?
c. Do you feel connected to others?
    i. Who and how?
d. How often do you contact others?

(8) Family Support
a. What role does family play in your life?

(9) Active work employment
a. Is it important for you to be actively employed now?
b. In what way is it important or not important?

(10) Volunteer Services
a. Does volunteering work improve your quality of life?
b. In what way does it affect you?

(11) Emotional and Psychological: Coping with challenges / stress, etc
a. What are the challenges that come with growing older?
    i. How do you cope with these challenges?
b. What kind of attitude or mindset is necessary for you to cope with aging?
c. What else would be useful?

Note: Begin summarizing main points about 30 minutes before closing (one facilitator to write on board and the other to copy on paper).

Main Question 2. **You have mentioned many factors contributing to well-being in aging; let's rank them in order for the top 3 most important.**

Main Question 3. **Are there any points that were not mentioned but you think is important?**

Part 4: CONCLUSION (close session)

A. Give thanks, provide facilitators contact info if necessary.

B. Distribute and collect back demographic questionnaire.

D. Give S$20 vouchers.

E. Debriefing for facilitators.
→ Come up with list of questions from discussion.
→ Write and send report.

Appendix 6. SLAS-I Project IRB Approval

Appendix 7. SSOSA Project IRB Approval

Appendix 8. Focus Group Project IRB Approval

Approval Number: NUS 732

NUS-IRB Reference Code: 09-089

NUS INSTITUTIONAL REVIEW BOARD (IRB)
APPROVAL CERTIFICATE

A) **Protocol Title:** Successful Ageing: Characterizing its Multiple Dimensions in Singaporean Seniors and the Development and Validation of a Measurement Scale for Healthcare and Promotion Programmes

Principal Investigator: Assoc Prof Ng Tze Pin

Department: Psychological Medicine

Institution: National University of Singapore

Co-Investigator: -Nil-

Sponsor (if applicable): -N.A.-

Research Site: Dept of Psychological Medicine
Yong Loo Lin School of Medicine
National University of Singapore

B) **Documents Reviewed**

Documents	Document Date
1. NUS-IRB Application Form	25 March 2009
2. Letter of Invitation	Version 2, 25 March 2009
3. Participant Information Sheet and Consent Form (for Focus Group Discussion)	Version 2, 25 March 2009
4. Questionnaire for Stage 1	Version 2, 25 March 2009
5. Interview Guide for Focus Group Discussions	Version 1, 25 March 2009
6. Investigator's Curriculum Vitae	--

C) The above-mentioned documents have been reviewed and have been approved on 31 March 2009. The Board is organized and operated according to GCP guidelines, BAC guidelines and the applicable laws and regulations of Singapore.

D) Please note that:

(1) No subject should be admitted to the trial before MCRC issues the certificate for the trial (applicable for drug trials only).

(2) This approval shall remain valid until the completion of the research or notification of termination of the research, whichever is earlier.

Page 1 of 2