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THE MULTI-DIMENSIONS OF SOCIAL PARTCIPATION OF OLDER ADULTS IN

HONG KONG

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The Multi-dimensions of Social Participation of Older Adults in Hong Kong

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Certificate of Originality

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Chan Cheong Yu, Stephen

Abstract

      Hong Kong is one of the places facing population aging, despite the Hong Kong Government has been devoting resources on fostering the quality of life or well-being for the older adults, individual efforts also constituted paramount influences on it. Social participation has been addressed as one of the key components across differential aging concepts. Nevertheless, social participation seemed to be a common construct that appeared in both subjective and objective definitions among these aging concepts. Consistent findings showed that higher social participation could be beneficial to older adults in various aspects including physical development, psychological well-being as well as cognitive preservation. Meanwhile, there has been a lack of consensus and measurement of social participation in gerontological field. The present study used the taxonomy of activity types to conceptualize social participation.

      One common way to understand about the overview of how older adults participate in specific kind of activities is to carry out the cluster analysis. This could be effective to categorize a population into sub-groups according to their participation rate in various activity types. Moreover, it is also possible to investigate the relationships between activity types and psychological well-being. Once the relationships were established, other significant associated relationships could be further investigated by considering the potential mediators including structural social support and functional social support.

      To achieve this aim, Study 1a and 1b adopted a cross-sectional study design. Study 1a investigated the social activity profiles of Hong Kong older adults. Subsequent analyses were performed to investigate the differences in socio-demographic variables, other social determinants as well as life satisfaction among clusters. Study 1b testified the possible mechanisms on how different social activity types contributed to life satisfaction through other

social determinants among older adults. Data were collected from community centers or non-governmental organizations within 1 year using convenience and snowball sampling in accordance with another aging project launched by The Hong Kong Jockey Club. A total of 719 respondents were included for Study 1, they completed a set of questionnaire originally capturing perception of age-friendly city, the targeted variables for the present study were included followed by it, which included socio-demographic variables, social participation frequency, social network members and its contact frequency, functional social support from social network members and life satisfaction.

Study 1a categorized two sub-groups of older adults in Hong Kong, namely, socially-active group (n = 320) and socially-less-active group (n = 399). Despite that socially-active older adults were more educated and reported better health status, they possessed more social members in their social circle and reported greater average contact frequency with them. They also perceived themselves with better social support, and most importantly, with better life satisfaction which was considered as the well-being indicator of successful agers. Thus, the key idea of Study 1a is that old adults with greater social participation should tend to have more benefits including more social recourses for social support and perceived better on evaluation of their life status.

Study 1b extended the investigation by taking the same samples for data analysis. Results indicated that not all activity types were associated with life satisfaction among Hong Kong older adults. Activity types including physical activities, recreational activities and voluntary work were found to be associated with life satisfaction. However, these relationships were partially serially mediated by social network size and functional social support or solely mediated by functional social support. Another activity of contacting others through technology

was not directly associated with life satisfaction, but the relationship was also fully serially mediated by social network size and functional social support or solely by functional social support. For cultural activities, only functional social support fully mediated the relationship. Study 1b highlighted the importance of some key activity types and the possible mechanisms of how these activities contributed to life satisfaction through other social determinants among Hong Kong older adults.   Furthermore, the role of functional social support has been emphasized and believed to be a more proximal factor to psychological well-being among the Hong Kong older adults as suggested in the literature.

Negative age stereotypes have been considered as one of the negative factors influencing various dimensions of well-being of older adults. Study 2 replicated and extended the investigation on how negative age stereotype priming could affect various processes of memory performance using an implicit priming task among older adults in Hong Kong. 105 participants were recruited for the experiment. Participants were primed either with negative age stereotype primes or neutral words by an implicit priming task which was framed as a reaction task prior to the episodic memory task. Results indicated that experimental group performed significantly worse than the control group among all measures in the memory performances. Follow-up analyses showed that social participation moderated the effects of negative age stereotype primes in the recognition task.

Social participation, measured by average frequency of activity types, was found to be a potential moderator on this effect. The initial empirical findings suggested that social participation might act as an effective strategy against negative age stereotype primes. Socially-active older adults might possess few negative age stereotypes so that the effect on activation of those negative age stereotypes was weakened.

Two studies established that social participation of older adults not just provide positive impacts on their well-being, it might also act as a protective factor that prevent the negative effects induced by age stereotypes. Recommendations for how to enhance social participation among older adults were discussed.

Publication arising from the thesis

Au, A.M.L., Chan, S. C. Y., Yip, H. M., Kwok, J. Y. C., Lai, K.Y., Leung, K. M.,… & Lai, S. M. K. (2017). Age-friendliness and Life Satisfaction of Young-old and Old-old in Hong Kong. *Current gerontology and geriatrics research*, *2017*. doi: 10.1155/2017/6215917.

Au, A., Lai, D. W., Yip, H. M., Chan, S., Lai, S., Chaudhury, H., ... & Leeson, G. (2020). Sense of Community Mediating Between Age-Friendly Characteristics and Life Satisfaction of Community-Dwelling Older Adults. *Frontiers in psychology*, *11*, 86. doi: 10.3389/fpsyg.2020.00086

Chan, S. C. Y., Au, A., Yip, H. M., Lai, S. M. K. (2019). Social Participation and Life Satisfaction: The Differential Mediating Effects of Social Network Size and Social Support among Young-old and Old-old. *Aging and Social Change*, *9* (2), 33-49. doi: 10.18848/2576-5310/CGP/v09i02/33-49.

Department of Applied Social Sciences. I was blessed that I could meet people coming from different places and extended my social circles.

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The end of one journey means the start of another new journey. I mightily enjoyed the Ph.D. journey and highly anticipated to the new one.

Table of Contents

List of Figures

List of Tables

Chapter 1
Introduction

Introduction

Every child aspires to get older, but when they get older, they wish to delay this process. The process of 'getting old' seems to be an individual process, yet, when people are in different stage of life, they might have different needs and encounter different difficulties that demand helps from their surroundings. In other words, aging should only not be taken as a personal issue, but a global matter as it could induce impacts in different parties of the society. In this introductory chapter, the aging situation and trend in Hong Kong would be first reviewed followed by a brief discussion of some fundamental concepts related to age-friendly city. Given that social participation would be one of the crucial factors contributing to better quality of life among older adults in Hong Kong (as reviewed in later sections in this chapter), the literature review would cover main theoretical models related to development of aging, factors and indicators regarding successful aging, how social participation has been conceptualized and how it has been associated with the well-being of older adults as well as the potential role of social participation in counteracting negative age-stereotypes.

Population aging in Hong Kong

Every country over the world is facing a certain degree of growth in aged population. Population aging refers to remarkably shift of the young to older age population. This sparking growth of aged population has been one of the global challenges for policy makers as well as stakeholders in the society. The number of people aged 60 or above would constitute, in estimation, around 22% of the global population in 2050 due to the fact of the declining fertility rate and longer life expectancy. Hong Kong is particularly encountering population aging particularly due to the aging population of post-war baby boomers, according to the Hong Kong Population Projections Report, the population of adults 65 and over will increase from 16.6% in

2016 to 36.6% in 2064, the median age is expected to increase from 44.3 in 2016 to 54.5 in 2066 (Census and Statistics Department, 2017). The growth of aging population would also be accelerated by other factors including persistently low fertility rate and prolonging life expectancy.

In spite of solely addressing the financial burden of the aging population in terms of retirement protection, medical care, and elderly services, the Hong Kong Government Policy Address highlighted that, optimistically, the new generation of aged adults would be more capable of contributing to the society since they will be healthier and better educated (The Hong Kong Government, 2016). To address this issue, the Hong Kong government decided to put more efforts on building an age-friendly environment and attracting talents to work. Initiatives include enhancing barrier-free access, outdoor facilities, and providing a safe and comfortable home environment and digital inclusion for age individuals. These measures are believed to promote better well-being of the elderly and are consistent with the idea of aging-in-place as well as the concept of age-friendly city (Chui, 2009).

Interest arisen from literature review and the project of Age-friendly City

In terms of aging, especially discussing how to age successfully or aging-in-place, there have been different discourses and assertions, when the general public was asked about the idea of successful aging, the word 'health' has always come at the first place, which seemed to be mostly treasured in our culture. The fact that maintaining health condition becomes more salient could be attributed to the inevitable effects associated with declining health, meanwhile, poorer health could be even exacerbated by other different risk factors such as reducing social support, loss of job or even financial strain due to retirement. One study has shown that perceived financial sufficiency could be associated with physical and mental health indicators after

controlling for socio-demographic variables. Yet but interestingly, this perceived variable was more related to psychological health than to physical health (Cheng, Chi, Boey, Ko, & Chou, 2002). As a psychology researcher, this raised to an argument of subjective evaluation might be more influential to objective measure, that is whether older adults perceive themselves as healthy is more important than objectively measure how many chronic diseases they might have which might not influence their everyday life (Schneider et al., 2004).

More and more research has been done in suggesting the possibility that psychological well-being could be the protective factor for health determinants (Steptoe, Deaton, & Stone, 2015). Age-friendly city, a term coined by the World Health Organization, is defined as a city where people could age actively for achieving better quality of life (World Health Organization, 2007). It also acknowledged that there has been diversity in older people and each individual diversity might vary over time, functional capacity would decline over the life course but the rate of decline could be largely influenced by factors associated with lifestyle. Having been involved in the project of Age-friendly City facilitates the examination of the diversity and the multi-dimensions of needs for older adults, ranging from physical environment to internal social demands. Eight domains were identified within the scope of age-friendly city including (i) outdoor spaces and buildings, (ii) transportation, (iii) housing, (iv) social participation, (v) respect and social inclusion, (vi) civic participation and employment, (vii) communication and information, and (viii) community and health services (World Health Organization, 2007).

Using questionnaire, we interviewed about 1000 people in two districts, Kowloon City and Kwun Tong, about their perceived age-friendliness of their corresponding district. Results on multiple linear regression analyses revealed that, regardless age group among older adults, domain of transportation and social participation were significantly positively associated with

life satisfaction after controlling socio-demographic variables (Au et al., 2017). One possible explanation on why transportation emerged as one of the strong variables is that the Hong Kong government has initiated the Public Transport Fare Concession Scheme, intended to encourage older adults to travel outdoors by public transport at a concessionary amount of two dollars per trip. Furthermore, reduced fares for transportation might facilitate elderly people to engage more actively in the society. Apart from the effect between life satisfaction and transportation as an environmental variable, social participation as another interesting variable is believed as a more abstract variable, lured the research interest to further investigate its relationship with well-being outcomes.

Aging-in-place

During the preliminary glance of literature pertaining to social participation, it is found that the idea of social participation has been indeed embedded in multiple inter-related aging concepts such as aging-in-place. Aging-in-place is one of the prominent concepts in aging policy in which it emphasizes the importance of allowing older people to remain living in their familiar place (Chui, 2009). The ideas not only avoid older people losing the sense of belonging and security by allowing them to stay in a familiar physical and social environment, but also suggest that aging in such environment could foster their well-being. While community care and housing issues could be arisen from facilitating the place for aging, one of the major imperatives suggested in the social policy for older people in United Nations Principles for Older Persons is participation (United Nations Human Rights, n.d.). It is suggested that older adults could live with dignity and achieve self-fulfillment if they could participate in the society which is linked to independence, interdependence and autonomy (Wiles, Leibing, Guberman, Reeve, & Allen, 2012).

The importance of social participation

To facilitate the notion of aging-in-place, numerous frameworks such as active aging and successful aging, which would be further discussed in Chapter 2, have been promoted (Phillips, Siu, Yeh, & Cheng, 2004; World Health Organization, 2007). Social participation is one of the noticeable factors addressed by the age-friendly city concept based on the framework for active aging, in which it is defined as a place where allows individuals to optimize opportunities for all-round development so as to foster quality of life when people age (World Health Organization, 2002, 2007). According to a study conducted in two districts in Hong Kong, Tuen Mun and Sha Tin, there were significant differences among all domains except the community and health services domain, socio-demographic variables were also found to be associated with various domain scores (Wong, Chau, Cheung, Phillips, & Woo, 2015). As discussed above, transportation domain and social participation domain were significantly positively associated with life satisfaction regardless of age difference. The findings suggested that not only physical environment or its supporting measures could facilitate the well-being of older adults, but also implied that various social determinants such as adequate social support and frequent participation in activities could shed light on the well-being of the elderly population in Hong Kong (Chan & Lee, 2006; Ho et al., 1995).

The relationship between social participation in the form of activities and well-being in the aged population has been further reviewed. It was found that the positive effects between social participation and well-being outcomes have been mostly consistent (Beck & Page, 1988). Researchers carried out a critical review on studies on social activity in later life, they concluded, particularly, the socially-productive or social activity was the key component, as reflected in most studies, in association with psychological well-being or subjective well-being (Adams,

Leibbrandt, & Moon, 2010). More examples include, psychologically, Baker, Cahalin, Gerst, and Burr (2005) have found that greater number of productive activities and more time committed are associated with better happiness rating. Voluntary services and work were positively correlated to happiness and life satisfaction (Hsu & Chang, 2015). Physically, Svanborg (2001) advocated that active engagement in productive activities might postpone declines in physical muscle performance and skeletal stability since they require complex physical functioning. Older adults with high-functioning were less likely to develop frailty if they participated in productive activities (Jung, Gruenewald, Seeman, & Sarkisian, 2010). Cognitively, older adults with frequent social engagement possessed fewer risks of developing dementia compared to those who were not socially engaged (Wang, Karp, Winblad, & Fratiglioni, 2002). Moreover, the rate of global cognitive decline was reduced by an average of 70% among socially active older adults compared with those who were not active (James, Wilson, Barnes, & Bennett, 2011). The positive impacts associated with social participation are apparently coherent.

The impacts of negative age stereotypes

     While well-being of the elderly could be promoted by various factors including social participation, stereotypes of aging could be detrimental to their well-being such as physical and mental health outcomes, cognitive and memory performances as well as perceived quality of life (Dionigi, 2015). Dionigi (2015) emphasized that although physical and cognitive declines in older stage were inevitable, the impacts of psychosocial and socio-cultural factors could be equally vital. Through experimental manipulations, negative age stereotyping induced adverse effects on different outcomes in elderly especially when the outcomes were related to memory and cognitive tasks (Meisner, 2011). Although various studies replicated similar results, there

have been far fewer studies done in Asian context where societal values on older individuals have been changing (Chiu & Yu, 2001). Although Asia culture comprises Confucius on humbleness, compliance and harmony, some studies have shown that older people living in urban setting rated more negatively in self-perception of aging than did the others (Bai & Chow, 2013). Modernization and urbanization would, on the one hand, lead to civilization, however, on the other hand, they cultivate negative views of aging by allowing the older adults to compare themselves with the others whom they perceived as better-off. Hence, investigation of presences of negative age stereotypes and their corresponding effects to cognitive performance of local community-dwelling adults would be noticeable for further development of policy on positive aging.

Research gaps

Gaps in theoretical dimensions

Theoretically, Activity Theory and Continuity Theory of aging which would be detailed in Chapter 2, provided the foundations for researchers, theorists and practitioners to account for the linkage between higher social participation rate and positive well-being (Havighurst, Neugarten, & Tobin, 1968). It suggested that social roles could be maintained and valued through participating in the social world (Baker et al., 2005; Hinterlong, Morrow-Howell, & Rozario, 2007; Jung et al., 2010). Empirically, studies supported participation in activities is believed to enhance social interactions which in turn promote physical and mental health as well as subjective well-being (Zhang & Zhang, 2014). Although the relationship is somewhat proved, it was asserted that the mechanisms of how different variables interact with one another were inadequate. Based on the literature review, it was found that social participation could be associated with life satisfaction among older adults, but this relationship could have been

mediated by other social indicators such as social network size and social support which were categorized as more proximal indicators.

Older adults who view themselves as more positive than negative tended to be successful agers (Chow & Bai, 2011). From an outcome-based approach, negative age stereotyping, on the other hand, seems to be essentially detrimental to the well-being of elderly. Numerous studies using different experimental paradigms or manipulations facilitated different theories to explain this effect (Dionigi, 2015). Nevertheless, growing bodies of studies supported that cognitive performances could be affected by psycho-social factors (Bourassa, Memel, Woolverton, & Sbarra, 2017). It has been argued that social systems supply opportunities for psychosocial mechanisms including social support and social engagement that directly or indirectly influence and regulate individuals' behaviours, psychology and physiology (Berkman, Glass, Brissette, & Seeman, 2000). Thus, it could also be argued that aged adults with fewer social capital might be expected to be more prone to negative aging stereotypes that would be reflected as the outcomes of poorer cognitive performances.

Gaps in scaling dimensions

After the advent of theories regarding concepts of social participation, quantitative researchers all over the world underwent a number of studies in exploring the how it was associated with well-being of aged adults. Scholars from different perspectives and different faculties might have deviated, although some elements could be consistent, the definition of social participation as well as the ways in which they operationalized it. Critical review showed there was a lack of accredited definition of social participation and measurement and that led to inconsistent results or difficulty of interpretations (Adams et al., 2010).

During the review process, some scholars have systematically reviewed social

participation and its relevant terms, and provided a taxonomy for scholar to carry out future

studies (Levasseur, Richard, Gauvin, & Raymond, 2010). Hence, in this thesis, the definition

concluded by Levasseur and her colleagues, based on this definition and taxonomy, was adopted.

Ten items with differential categories and levels of social activities were created. The

standardized conceptual taxonomy for measurement could foster consistency and comparable

results across literature.

Gaps in cultural dimensions

Massive studies have been done on aging in western countries, indeed, little research has

been found regarding social participation of older adults in Hong Kong context. The benefits

facilitated by social participation might vary in different cultural settings. Cultural differences

like cultural values have long been investigated and proved to be constant over time (Barkema &

Vermeulen, 1997). Taking western findings to generalize the Asian population could be

problematic as there could be specific East-west differences in cultural norms and values. One

of the most reviewed core difference attributed to individualism versus collectivism, in which it

referred to how people focus on personal or group interests and goals (Barkema, Chen, George,

Luo, & Tsui, 2015). Easterners are said to be more collectivistic and they tended to maintain

group harmony and pursue group interests. Moreover, these values were also bound with

Confusion values such as filial piety and family commitments which might hinder social

participation of older adults as their children would expect their parents to stay at home for

enjoying their retired lives (Chong, 2010). The value of pursing collective goals rather than

individual goals could further deter older adults from participating in different forms of activities.

Yet, it did not necessarily mean that Chinese older adults are passive. Paradoxically, Chinese

older adults have been consistently active in the society. For example, Chong, Rochelle, and Liu (2013) reported that older adults aged between 60 and 75 demonstrated the lowest voluntary work rate but devoted most hours on volunteer work. Apart from volunteerism, it would be sensible to investigate how social activities cultivate social benefits and facilitate mental well-being of older adults.

To achieve the goal of successful aging, one of the stumbling blocks could be ascribed to negative age-stereotypes. In general, older adults who possessed more positive views tended to achieve successful aging (Bai & Chow, 2011). In contrast, negative images or negative stereotyping could be predictive of poorer physical and mental health. Moreover, the negative view of aging have been shown as prevalent across cultures although it is commonly assumed that age-related stereotypes are more positive in Asian culture (Boduroglu, Yoon, Luo, & Park, 2006). For example, a comparative study showed that Asian and European people possessed more positive stereotypes than other western countries but negative stereotypes were consistently maintained (Nelson, 2005). Studies have shown there could be detrimental impacts on various outcomes (to be detailed in chapter 2) once their negative age-related stereotypes were activated. Although a number of studies consolidated the relationship between activation of negative age-stereotypes and performance outcomes, most were done in western countries (Chiu & Yu, 2001). The lack of studies may be attributed to the underlying assumptions of traditional Chinese values, believing that older adults should have positive but not negative views of themselves or significant others (Tsai & Lopez, 1998). Yet, the trend of these traditional values has been challenged and found to be changing both positively and negatively. Thus, the effects of negative age-related stereotypes would be worthy to be discovered, especially in the context of Hong Kong.

Objectives and significance of present studies

To fill the aforementioned research gaps, the present thesis aimed at investigating the profiles of social participation, operationalized in different types of activities, in local context, its mechanisms to better well-being of older adults and discovering whether social participation could be a buffer for negative age stereotypes. To be more specific, the thesis consisted of the following objectives:

(1) (a) To categorise different types of sub-population based on the general profile of social participation in terms of activities of older adults.

(1) (b) To examine any similarities or differences based on the identified clusters.

(1) (c) To testify different models of how social participation contribute to life satisfaction

(2) (a) To examine the presence of the effects of negative age stereotype primes on episodic memory using an implicit priming task

(2) (b) To investigate whether social participation moderate the effect of (2) (a).

In the absence of a validated tool on measuring social participation, a list of types of different activities was designed and approved by scholars in gerontological field. Taking this approved version of different types of activities as a measurement of social participation, using a cross sectional approach, Study 1a attempted to categorize local community-dwelling older adults based on the variation of participation frequency on different types of activities and investigated their features and their relationships with other indicators including health status and other social variables. Study 1b, taking the same set of samples, aimed at exploring the associations between social activities and psychological well-being of community-dwelling older adults and also exploring the contribution of different types of social support on this relationship based on the conceptual model suggested by Douglas (Douglas, Georgiou, & Westbrook, 2016).

In terms of practical aspect, Study 1a and 1b could enhance better understanding on the patterns of different types of social activities to be done by older adults in Hong Kong, and with reference to the sub-groups, it may provide more insights for future interventions or domain-specific implementations of programs. Moreover, it could help formulate a cultural-specific formula for facilitating a social environment or even successful aging and better aging-in-place among Hong Kong older adults. In terms of theoretical contribution, the relationship between social participation and well-being could be further consolidated by path models. Specific path models could not only allow researchers to testify the significance of indicators, but its proximity to different outcome variables. Prioritizing different variables in the model could promote clearer understanding of how one variable is closely or less closely associated with another variable. This study could extend the knowledge of literature by evaluating how the relationship between social participation and life satisfaction was mediated by corresponding sources of social support.

Using a randomized experimental design, Study 2 was carried out to investigate the effects of negative age stereotype primes on episodic memory using implicit priming manipulation and further investigate whether social participation could moderate the above effects. Previous studies investigating the effects of negative age stereotype on various outcomes were mostly done in western cultures, the presence of the corresponding effect in local culture has yet been unknown. Study 2 was of principal significance as it would provide the pilot picture of the presence of effect of negative age stereotype on memory performance among Hong Kong older adults. It also provided implications that by reminding participants of how socially active they are might act as an effective strategy against negative age stereotypes.

Organization of the Dissertation

      This dissertation comprised 5 chapters. Chapter 1 provided introduction of background information, research interest arisen from previous experiences as well as rationale of the current studies. Chapter 2 included literature review on theoretical background of models of development, the importance of successful aging, the extended literature search on social participation and its related constructs, age-related stereotypes and their impacts on old adults. Chapter 3 provided the conceptual framework of both Studies and all hypotheses. Chapter 4 covered the details of Study 1 including methodology, results and discussion. Chapter 5 depicted the details of Study 2 including the rationale of methodology and experimental procedures, followed by the results and general discussion. It also involved the overall discussions of findings as well as the implications of the studies and further elaboration.

Chapter 2

Literature Review

Outline of Chapter 2

This chapter served as a summary of the literature review. It comprised several main components, the key theoretical background in social gerontology, different discourses of successful aging, related concepts including social capital, and the effects on well-being induced by age stereotypes.

Using a top-down level approach for literature review, the theoretical background of models of development and ideas of successful aging were first reviewed. Theoretical ideas conceptualizing aging development and the ideas of successful aging were discussed. A summary of the two approaches were presented, specifically, the life course perspective and psychosocial perspective. A summary on the overall definition regarding definitions of successful aging was also generated.

After considering the macro ideas of how different perspectives look into aging and the commonalities found in successful aging as well as how different definitions tackle with the constructs of well-being of older adults, one part of this chapter discussed the importance of social participation and its relevant social indicators including social network and social support. These social variables were usually used interchangeably under the umbrella of concept of social capital (Shiovitz-Ezra & Litwin, 2015). To consolidate the benefits of how different social determinants may benefit to the well-being of older adults, the review of well-being studies related to social network types, social support, and social participation would be covered.

Revisiting the ideas of social indicators among older adults, social participation resides paramount position in determining successful aging. Meanwhile, effects on self-perceptions of aging have been raised (Wurm & Benyamini, 2014). The remaining section of this chapter covered two inter-related constructs, ageism and age stereotypes.   The mechanisms of how

priming age stereotypes affect different performance outcomes and the potential protective role of social participation would be included.

What is aging?

Aging is a general term implying a period of human existence. It could be classified by four aspects: chronological, biological, psychological and social aging (Phillips, Hillcoat-Nalletamby, & Ajrouch, 2012). Chronological aging refers to the exact and objective number of years of existence. Although it is just a measure of how long for an individual exist in the planet, it is associated with a set of meaningful roles or expectation or even behaviours. A simple example includes one could take an identity card with a face picture on it when the chronological age reaches 18. This dimension of aging might not be interesting, at least to me, since it is just a set of numbers towards death.

Biological aging, also known as functional aging, concerns biological events across life span, these biological events are inevitable and would both directly and indirectly affect physiological system of individuals. The whole process of aging is affected the interplay between nature and nurture of individuals. Psychological aging captures life-related changes with regard to personality, mental, sensory and perceptual processes while social aging interests in looking at changing experiences of individuals within a social structure. As we age, we would develop the sense of identity through social aging and psychological aging, we would also face different physiological changes among ourselves or even peers through biological aging. Basically, these three dimensions of aging interplay with one another, it is necessary to explore different aspects and models of development through these dimensions.

Key models of development

Life course perspective

One of the mainstream perspectives under socio-cultural models is the life course perspective, in which it considers one's development is interminable. Within a theoretical scope, it raises awareness of the importance of historical conditions and changes, which help researchers understand individual development and family life. Age provides clues for investigation of the changing contexts of individuals (Bengtson, Elder, & Putney, 2005). This perspective considers lives are shaped by the age norms, roles and attitudes (Settersten, 2006). For example, when you reach to a certain age in the family, you will be expected to possess certain identities, roles and responsibilities pertaining to the generational position, meanwhile, there could be different members who come from other age cohorts to interact with you to facilitate different activities. This kind of interaction promotes life course variability which persistently shapes our identities and roles.

In general, life course perspective emphasizes life events, those courses are shaped by the society and culture that should be in common with all individuals. In this dimension, specific theories have been proposed to capture how individuals adapt to the society for achieving better psychological well-being. Social gerontologists considered age as the key structure which impacts on the quality of adaptability (Whitbourne & Whitbourne, 2014).

The first advent of formal theory of aging would be considered as the Disengagement Theory proposed by Cumming and Henry (1961). It generally outlined the inevitable process of social withdrawal of older people as they age. With the assumption that old age is a different stage in the life course, they defined the disengagement as an ineluctable process in which old people would disunite many of their relationships and interactions with other social members in

order to achieve a new equilibrium featured as distant and altered type of relationship. They

argued that that the disengagement is natural as all individuals are expected to die one day,

therefore when individuals experience some physical and cognitive declines, they would no

longer be willing to engage or even incapable to further engage in the society. Hence, roles and

activities of individuals would be weakened or even terminated. Disengagement would be

initiated either by the social system or individuals themselves but once the process occurs, it

turns into a loop leading to greater reduction of interactions with others. It is also suggested that

this process is irreversible and universal since the society persistently reinforced the mentality of

feasibility of disengagement. Therefore, older people have to adjust and adapt to the pessimistic

situation so as to cultivate a better well-being for themselves. They suggested that those who

could accept and could be willing to get through the process of disengagement would become the

happiest cohorts. Whilst the idea has been criticized because of its flawed premise, this theory is

yet considered as a guide for interpretation of the disengaging process of older adults and other

scholars began to formulate other theories based on its negative presumption.

As a response to Disengagement Theory, the Activity Theory, proposed by Havighurst

(1961), suggested the psychological and social demands of old adults are still dominant, isolation

or withdrawal is not a normal process, yet, if elderly choose so, it is likely due to the occurrence

of some life events which are uncontrollable. It was postulated that older adults would still need

to pursue and achieve psychological and social needs despite changes in physiological states

(Havighurst, 1968). To fulfill these needs, there would be a tendency for older adults to seek

associations with others and to engage in group affairs regardless of social norm constraints. The

key to happiness or life satisfaction was determined by the level of participation in activities

and/or social involvement, the more active and involved the elderly were, the better the

psychological well-being would be. The rationale behind Activity Theory has mostly been related to social roles and identities. Participation in activities inaugurates a channel to reform and consolidate self-concepts. Continuous participation could foster the dynamics in positive role affirmation which could be associated with better life satisfaction (Knapp, 1977).

There has been one of the critiques regarding the over-positive assumption based on Activity Theory. It is still sensible for old people not to wish to engage actively and involved in work or other circumstances. Scholars have addressed the Continuity Theory which was an advanced version of the Activity Theory under life course approach (Atchley, 1989). The main emphasis of Continuity Theory was that it considers the importance of personality and the personal history. On the one hand, the internal continuity referred to a stable inner structure and this structure maintains its constituents across time, for example, our personality traits and temperament usually remains stable. On the other hand, external continuity referred to the recollected physical and social environment and its connecting activities and social roles. It helped maintain a stable self-concept and lifestyle because it provided a medium for individuals to validate the structure or relationships and their behaviours. The degree of continuity could be highly dependent on how individuals categorize themselves and how they evaluate the dynamics between both continuities. For instance, the degree of social participation of older adults would be determined by their personality traits, socially active individuals may continue to participate actively as they age and vice versa. Continuity is a kind of adaptive strategy for optimizing aging and that allows older people to prevent or minimize the effect of deficits occurred in normal aging.

Among three theories, the Activity Theory has been saliently dominated in the literature, as a substitute of optimal aging and modified version of Disengagement Theory. It is used to

37

account for life satisfaction in later life. As mentioned, activities could foster older people to confirm their identities and roles that they highly value (Hillier & Barrow, 2015). Other studies suggested that older people with larger social networks and greater engagement in activities were less likely to develop depression than those without them (Lennartsson & Silverstein, 2001). There also have been various studies done echoing the positive impacts from volunteerism (McMunn, Nazroo, Wahrendorf, Breeze, & Zaninotto, 2009; Morrow-Howell, Hinterlong, Rozario, & Tang, 2003).

Psychosocial perspectives

Psychosocial perspective attempts to explain behaviors are characterized by distinct stage in one life (Whitbourne & Whitbourne, 2014). It focuses on the adaptive changes that elicit within the individuals across stages with the assumption of universality of development. Erikson's Psychosocial Theory was first reviewed; this theory focused on development of the conscious self across life span. It posited that there is a common pattern in all human development; every individual is facing similar development tasks during each developmental stage (Erikson, 1963).

Focusing on the aging population, according to Erikson's theory, the seventh and the eighth stage were related to middle or late adulthood. In the seventh stage which encompassed the dilemmas between generativity versus stagnation. Bjorklund (2015) stated generativity is pertaining to the establishment of guiding the next generation. Middle-aged adults should search ways in order to fulfil the needs of generativity. The generativity could be established through activities such as child-rearing, supervising or guiding the younger generation and creative work. Furthermore, the presence of concerns and caring of the younger generation would become the vital aspect of generativity. When it comes to the very late adulthood regarding mortality,

individuals will be encountering the stage of ego integrity versus despair. Individuals would face several developmental challenges, they might need to care others as well as accept to be cared by the others, they might also need to develop an ability to look back and accept all aspects of their lives. This sense of acceptance allowed them to accept the inevitable mortality. Integrity would be achieved once the aged individuals became satisfied with their lives.

Another psychologist, Geroge Vaillant, extended Erikson's work on stage development (Vaillant, 2002). There were two more stages identified lain between old-age development, the Career Consolidation stage and Keeper of the Meaning stage. Keeper of the Meaning is a stage where the cohorts lay between 50s and 60s, it referred to the development in which individuals focus more on conserving and preserving collective products of mankind. It is a stage very similar to generativity but generativity concerns more about individuals while Keeper of the Meaning deals with more to the society. It is found that older adults become less self-centered, tend to be more other-centered and will be more willing to engage in voluntary work and community affairs. In other words, older adults at this stage would like to contribute to the society by revealing acquired skills through the virtues of wisdom and justice as well as a combination of intimacy and career consolidation, without specifically taking sides to help specific individuals.

Neugarten, Moore, and Lowe (1965) have considered that age norms in regulating life course. They symbolized that there is an alarm clock which informs individuals the schedule for, they called as, age-appropriate behaviours. These norms are bound by culture affected but more or less are consistent. For example, people will get married in between 20s and 30s, older adults may consider retirement at around age 55. Satisfaction or distress would be emerged as a result of subjective evaluation of personal life or social sanctions. Neugarten also suggested that there

might be differences in age norms even among aged adults particularly attributing to the fact that life expectancy and health situation have been advanced (Neugarten, 1974, 1975). From her study, she identified two major groups of aged adults, the Young-old and Old-old, aged 55 to 74, and 75 or above respectively. Through illustrating the differences, for example, the Young-old expressed that they demanded more self-enhancement and community participation since they possessed better educational status. She argued that there could be an emergence of Young-old who could create non-age-relevant exchange with other age groups. Reflected by Neugarten's study, stage development after 60 would be possible since longer life expectancy and better health would be anticipated in the society. This notion has become more reliable and has also been investigated with reference to the ninth's stage of Erikson's psychosocial development done the Erikson's wife, Joan Erikson (Brown & Lowis, 2003). From their results, they found that those who were very old, usually in their 80s and 90s, had significant ratings in the questionnaires of resolutions of stage 8 and 9 although significant correlation was found only in the relationship between age and the resolution of stage 9. This last stage of development is said to be proved and this stage suggested that older people are not only achieving productivity and creativity, but also pursuing a new quality of life (Bugajska, 2017). This could be argued that different aged individuals are able to judge and set their corresponding social clocks so that there could be differences in one's development although those events should be likely similar.

Interim summary of models of development

Two major models of development have been reviewed, each perspective possess its own assumption and postulates. The life course perspective, particularly the Activity Theory, furnishes the positive view of why older adults would choose to be engaged or disengaged in activities in a certain way and how this practice could facilitate the valuable roles and statuses

from their point of views. The psychosocial perspective, in terms of stage development, utilizes a more macro and universal view toward aging. It is obvious that older adults may encounter typical life events such as retirement and loss of love ones during old stage, the stage developmental view tries to depict a holistic and unified view on aging and explains older people engage in the social world as a way to achieve generativity. Hence, engaging in the social activities is one of the common ways for the older adults to contribute to the community in order to foster the sense of achievement and optimism. Concurrently, without repudiating the original idea of universality, Neugarten's insight extends the view of stage on aging since she found there is diversity among those who are over 65. Late adulthood should be considered as various stages rather than one single stage and social participation in terms of social activities might also be varied across different age cohorts, especially those who are young-old with better education level and health status.

To sum up, the life course perspective provides the possible explanations of how social participation contributes to well-being of the older adults, whereas the psychosocial model advances the conceptual framework that social participation should be a universal outcome although there could be variation across various age groups.

Successful aging

With similar notion from Activity Theory, Havighurst et al. (1968) also suggested that that the inner feelings of happiness and satisfaction in one's life should also be included as criteria of successful aging. Positive relationship between staying active and aging successfully or optimally is generally proved in the literature. Many of the previous studies have chosen the concept of successfully aging and linked it with life satisfaction (McPherson & Wister, 2008). In a broader sense, active and successful aging should comprise both satisfaction as well as growth

and progress with a set of criteria including developing a positive sense of oneself and relations with others, allowing acceptance of the past and the present, maintaining autonomy and control over one's environment, active participation in activities, and having a purpose in life (Ryff, 1989). Ryff's idea has also challenged the idea of whether growth is still possible in a developmental process at that time.

With the controversial discussion on how to conceptualize 'aging well', numerous terms have been advocated including 'successful aging', 'active aging', 'healthy aging', 'productive aging' and 'competent aging' (Foster & Walker, 2015). Each concept varies divergently to the gains and potentials of aging despite overlapping elements are not uncommon (Baltes & Smith, 2003). The most prominent and dominant term could be successful aging, it has been intertwined with other aging terminologies such as 'active aging', 'vital aging' or 'productive aging'. In general, gerontological scholars challenged the compatibly negative view of aging and supported the notion of enabling the participation of the elderly, and started to define and differ successful agers from normal agers (Barrett & McGoldrick, 2013). Although the construct of successful aging has been extensively studied in social gerontology, there have been variations in terms of definitions and even whom to define it (Alley, Putney, Rice, & Bengtson, 2010). In the following section, key definitions of successful aging were reviewed, they were mainly proposed by Rowe and Kahn (1987); Baltes and Baltes (1990); Kahana and Kahana (1996); Depp and Jeste (2006); Phelan and Larson (2002); and Pruchno, Wilson-Genderson, and Cartwright (2010) respectively. A brief summary and elements of each definition was compiled as shown in Table 2-1.

Rowe and Kahn's definition

Among four definitions, the definition advocated by Rowe and Kahn has been the most prevalent one. Traced back to 1980s, Rowe and Kahn (1987) initiated the link to differentiate successful aging from usual aging in non-pathologic states. In their earlier work, sustaining physical health and avoiding diseases were the key components. They then further conceptualized the definition and presented a reformed one using a graphical manner. According to Rowe and Kahn (1997), three essential components for achieving successful aging were avoidance of illnesses or diseases, maintenance of high functioning levels, and active social engagement.

The first component was the low probability of diseases; it underscored the importance of absence of both diseases and risk factors leading to physical illnesses. Through considering studies related to heritability, lifestyle and risk factors, they concluded that both intrinsic and extrinsic factors should be involved in determining the risk in later life, the impact of genetic factors contributing to diseases was relatively non-significant compared to non-genetic factors, last but not least, the characteristics of usual aging were changeable, implying the risks of diseases could be modified by both environmental and behavioural factors.

Sustaining and maximizing cognitive and physical function levels was the second vital component. They put forth this idea based on their longitudinal study of identifying to what extent those physical, psychological, social and biomedical factors were associated with high functioning in later life. Their results indicated that education, strenuous physical activity, peak pulmonary flow rate and self-efficacy showed direct effect on maintenance of cognitive functions while socio-demographic impacts such as being older and with lower income were associated with maintenance of physical functions. With regard to cognitive functioning, they

argued that there could be positive changes in old age as evidenced in previous studies across studies. Given this possibility, older adults are able to regain a certain level of cognitive functions as long as their physical and cognitive capacities are available.

The last component was continuing engagement with life. They took this active engagement in terms of two forms: maintaining interpersonal relations and involving productive activities. The former one consisted of social contacts and exchange of information with others, as well as receiving and providing support or even assistance. Developing and maintaining interpersonal relations prevents old adults from social isolation which has been identified as a risk factor for health. It also promotes social support which is believed to induce positive health-relevant effects. They also argued that there is no universally effective type of support but the effectiveness is subject to the demands and situational factors. Productive activity engagement facilitates societal values regardless of whether it is paid or unpaid. It is found that elderly productively contributed to the society more specifically in providing assistance and carrying out voluntary work compared to those who are regularly employed.

	Rowe and Kahn	Baltes and Baltes	Kahana and Kahana	Depp and Jeste; Phelan and Larson	Pruchno, Wilson-Genderson and Cartwright
Definition defined by	Objective criteria	Individual assessment on goal attainment	Both Objective criteria and ability of individual assessment	Comprehensive review	Both subjective and objective measures
Definition of successful aging	Successful aging is stage where individuals must fulfil all three elements simultaneously.	Successful aging is a developmental and adaptive process which help older adults manage their lives.	Successful agers have the ability to take preventive and corrective actions in response to stress.	Successful agers are the majority of absence of disability with lesser inclusion of psychosocial variables.	Successful aging as having both an objective and a subjective component.
Elements of successful aging	(i) Avoidance of illnesses or diseases (ii) Maintenance of high functioning levels (iii) Active social engagement.	(i) Selection (ii) Optimization (iii) Compensation	(i) Manipulate internal and external resources (ii) Preventive adaptations (iii) Corrective adaptations	(i) Physical functioning (ii) Cognitive functioning (iii) Life satisfaction (iv) Social/ productive engagement (v) Presence of illness (vi) Longevity (vii) Self-rated health (viii) Personality (ix) Environment (x) Self-rated successful aging (xi) Mastery/growth (xii) Positive adaptations	(i) Objective measures including functional abilities, little or no pain and few chronic diseases (ii) Subjective measures including perceptions regarding aging well and overall evaluation of life

Table 2-1 Different definitions of successful aging

Once all three components overlap, one could be considered as a successful ager. This model has been widely adopted, assessment of each component has also been developed since all these three components are testable.

Critics of their model mainly included the underestimation of successful agers, ignorance of life course interactions, the incapability of addressing adaption for those who are labelled as unsuccessful, which may lead to discrimination and stigmatization (Bowling, 2007). Some scholars have even brought new ideas such as harmonious aging up to prevent that kind of labelling (Liang & Luo, 2012). According to Depp and Jeste (2006), they systematically reviewed 27 major studies on successful aging and found the prevalence rate was dramatically ranged from 0.4% to 95%. Bell et al. (2014) have conducted a cohort study with age standardized to 70 years at baseline, less than 25% survived to age 85 years are healthy and the prevalence rate of successful aging dropped to less than 1% for those survived to age 95.

Baltes and Baltes's definition

Another definition of successful aging was raised by Baltes and colleagues, they provided a brief theory to conceptualize successful aging within the scope of processes, namely, the antecedent conditions, the key processes and the outcomes (Baltes & Baltes, 1990). They defined successful aging as "the attainment of goals which can differ widely among people and can be measured against diverse standard and norms" (Baltes & Carstensen, 1996, p. 399). This model adopts the life course perspective with addition to the integrated approach through analyzing the social and cultural context of individuals. The vital processes include selection, optimization and compensation (S-O-C), successful development comprises the interplay of these processes, and the interactions of processes allow individuals to achieve the maximization of gains and minimization of loss, which are considered as the regulatory key to successful aging.

The process of selection implies goal restriction with aging, particularly choosing accomplishable goals from a pool of wishing goals. Studies have empirically supported this notion. For example, individuals who ages 70 and above listed about 2.8 goals (Lawton, Moss, Winter, & Hoffman, 2002). Riediger and Freund (2006) reported that younger adults listed more personal goals than older adults who were aged between 60 and 69. Nevertheless, it is noted that the effect on goal restriction may not be profound enough for significant prediction across life span (Penningroth & Scott, 2012). After adopting appropriate goals, focusing on the selections is the next step. In general, older adults tended to reduce peripheral social relationships while maintain their close relationships with significant people.

Furthermore, it is argued that older adults would shift their focus of goals from gains-based to maintenance-oriented or loss-prevention-oriented (Baltes & Baltes, 1990). Older adults would be less interested in investing resources in attaining higher level of functioning while they would like to emphasize the avoidance of illnesses or negative outcomes. Hence, they would be more likely to opt goals such as staying healthy and preventing to get ill. Empirically, studies tended to support this idea, for example, Ebner, Freund, and Baltes (2006) revealed that older adults listed more goals on a loss-prevention basis compared to younger adults, and younger adults would like to rate their goals as growth-oriented and gain-based.

Yet, the process of S-O-C could be both considered as single dimensional aspect or three separate components in which each component contributes to successful development (Freund & Baltes, 1998). More specifically, individuals need to select and focus on relatively more important life issues or goals, so they need to optimize the developmental resources for successful goal pursuit and minimize losses related to biological, psychological and socio-economic constraints by compensatory means. Freund and Baltes (2000) have indicated the

importance of the processes in S-O-C of elderly as it is undoubted that their resources would be reducing across time while multiple stressors might exert greater forces on their well-being. In this sense, their main goal would be directed to tackle this wrestling relationship of maximizing gains and minimizing losses.

S-O-C model has become famous for its unique feature of allowing distinct individual development of successful aging since goals may vary among individuals. Moreover, these goals could also be culturally-bound (Baltes & Carstensen, 1996). Noting the fact that resources are scarce, it is not possible for us to achieve every single goal, at least not synchronously. Hence, prioritizing goals in order is subjective and adaptable for development which leads to the deliberate selection of attainable goals based on the present resources. Individuals would then optimize their resources to achieve this goal, for example, one could take time to learn new skills or simply learn from successful others. When resources become scarcer, compensation strategies would be important for preserving the goals. If one became older, losses might dominate gains, selection would rely more on the attainable and achievable goals. Older adults would reconstruct the hierarchy of goals, as a result, disengagement from numerous goals or even development of new goals would be resulted. This view has consolidated the basis for the Socio-emotional Selective Theory (SST) proposed by Carstensen (1992) which would be detailed in later section.

Kahana and Kahana's definition

Admitting that there was a group of older adults who are relatively active to physical and environmental constraints, scholars proposed a comprehensive model concerning successful aging called Preventive and Corrective Proactivity (PCP) (Kahana and Kahana, 1996). From their point of view, older adults are facing normative stress from diseases and social deficits, yet, it is still possible to maintain good quality of life when older adults could manage to deal with

internal and external resources. Their approach also buttressed on Neugarten's idea that normal and scheduled life events could foster adaptation instead of threats to individuals. Generally, it was assumed that stressors from illnesses, losses and person-environmental incongruence could lead to outcomes of successful aging and quality of life. Yet, this relationship could be buffered by external resources such as financial and social capital. Preventive and corrective adaptations could also constitute behaviours driving to successful aging while internal resources such as hopefulness and self-esteem could play a role in affecting the manipulation of adaptive approaches. Demographic variables were assumed to affect more on successful living which is stated as a fundamental component in this model and affect successful aging indirectly.

Specifically, proactivity included proactive preventive adaptations and corrective adaptations. The former one was the proactive behaviours that help delay the onset of physical frailty and build up resources before any onset of illnesses, it included three components: (i) health promotion, (ii) planning for the future, and (iii) helping others. Health promotion helped prevention in reducing the risk of suffering certain kinds of age-related illnesses. Regular physical activity, in no doubt, was a direct way to this adaptation. The use of planning strategies was responsible for better cognitive responses and better well-being and it helps to enhance financial and social recourses available to older adults (Lachman & Burack, 1993; Lawton, 1989). Helping others as well as social participation could boost informal social resources available, it also enhanced altruistic behaviours. Corrective adaptations included behaviours that could alleviate the stressful life situations, it comprised (i) marshaling support, (ii) role substitution, and (iii) environmental modifications. Marshaling support referred to the individual initiatives to ask for support under stressful conditions. Role substitution was a strategy to

counterbalance role losses by helping older adults to compensate the consequences from social role losses. Environmental modification concerned both relocation and activity modification.

This model has been used in researching vulnerable older adults such as older adults with HIV or AIDS (Emlet, Tozay, & Raveis, 2011). It has been further elaborated under consideration of temporal and environmental impacts on successful aging (Kahana, Kelley-Moore, & Kahana, 2012). This approach is considered as a combined model of successful aging, with preventive adaptations are concepts related to Rowe and Kahn's model while the corrective adaptations are consistent with cognitive evaluation of S-O-C proposed by Baltes and Baltes.

Other definitions of successful aging

As shown in Table 2-1, some scholars used other ways to define successful aging. For example, Depp and Jeste (2006) carried out a comprehensive review of quantitative research and they opined that there is a wide range of successful agers and bio-medical model should be extended to bio-psycho-social approach. Another literature review concerning the definitions of successful aging and its relevant predictors was also done by Phelan and Larson (2002). Jeste, Depp, and Vahia (2010) re-examined the definition by taking the cognitive and emotional dimensions. They realized that when two domains of absence of disease and freedom from disability are involved, tremendous drop in rate of successful agers would be seen. Surprisingly, older adults are considered as successful agers when other domains, but not physical domains, were operationalized. This delineated that most of the older adults might not be as pessimistic as researchers thought as, rather they have the optimistic faith in their aging process and subjectively think themselves as successful agers. Jeste et al. (2010) admonished researchers to re-think about the definitions of successful aging since it seems there is a sizeable disparity in terms of perceptions.

Some other researchers have emphasized on capturing successful aging using a subjective dimension, as proposed by Strawbridge, Wallhagen, and Cohen (2002, p. 728), it would be more comprehensive by "letting older persons to rate their own success at aging". Pruchno, Wilson-Genderson, Rose, and Cartwright (2010) argued for a two-factor model of successful aging that includes objective and subjective success as two independent, but related dimensions. Their studies showed that objective and subjective criteria constituted a two-factor model while objective measures were related to age and gender but no associations were found in subjective measures (Pruchno, Wilson-Genderson, & Cartwright, 2010).

Interim conclusion regarding definitions of successful aging

A review paper has identified there are indeed two distinct schools in investigating the definitions of successful aging (Glass, 2003). Focusing on the mental elements is the goals of psycho-social school while the biomedical school stresses on the avoidance of diseases and disabilities. This delineation somehow explained the diversity of definition on successful aging, however, Martin et al. (2015) warned that the understanding from the researchers' perspective could be parsimonious. They also suggested researchers should take macro factors into consideration such as how technology and globalization affect the lives of older adults for the future direction.

The first section of this chapter has first introduced three major perspectives on looking into aging and re-visited various ideas of successful aging. In general, among different conceptualizations, it could be seen that there has been a transformation from objective measures to subjective measures in understanding successful aging. In gerontological studies, more and more scholars tried to adopt a multidimensional model to capture indicators associated with well-being of the elderly. This invitation of multidimensional models could reduce biases in

capturing the mechanisms in well-being research but it might induce complexities in practical aspect.

Nevertheless, the ideas of successful aging seemed vary in a certain extent, it is still noticeable that there could be some overlapping elements among them. The idea of active engagement in life is one of the obvious components found among all definitions no matter they are objectively defined by researchers or subjectively raised by the older adults themselves. This supported that staying socially or physically active is supposedly vital and could by resonated by the above reviewed theories such as Activity Theory and the notions of generativity.

Conceptualizing the antecedents and consequences of social activities

Social scientists have explored the key antecedents and consequences on productive engagement in later life (Bass & Caro, 1996; Sherraden, Morrow-Howell, Hinerlong, & Rozario, 2001). This model suggested that levels of social engagement are influenced by social policy, environmental, situational and individual elements. Morrow-Howell extended the model by incorporating socio-cultural factors. Generally, social engagement could be influenced by antecedents including individual, community and societal characteristics while social engagement could lead to individual and societal outcomes (Morrow-Howell & Greenfield, 2016).

This model merely captured antecedents and consequences that affect productive engagement among older adults, that could be over-simplified as constructs were largely unidirectional. Recently, an innovative framework regarding productive engagement in a System Dynamics Framework has been addressed by Morrow-Howell and her colleagues (Morrow-Howell, Halvorsen, Hovmand, Lee, & Ballard, 2017). It is a more fluid model using System Dynamics Framework which addressed the relationships between social activities of

older adults and different constructs ranging from personal factors including social capital, human capital, and family resources to societal factors including capacity of organizations, attitudes and expectations as well as policies to support social engagement.   In this thesis, the construct of social capital such as social network and social support was the main focus. Higher levels of social participation have been associated with greater levels of social capital. Morrow-Howell's model provided rationale that served as the foundation for literature search in the following sections.

The emergence of studying social network and social support

Social relations or social network was defined as a "collection of interpersonal ties that people of all ages maintain in varying contexts" (Litwin, 2001, p. 516). The studies of social relations provided insights for researchers to understand more about how they contribute to the well-being especially the aged population and across their life course. Earlier interdisciplinary studies supported this notion, examples include the ideas from sociologist Botts (1957) as well as public health clinician Cassel (1995). Cassel (1995) suggested that the role of social support rather than the reduction of stressors could be a better preventive measure for diseases. These studies have acknowledged that social relationships act as a key component of well-being as well as a crucial determinant of health (Antonucci, Ajrouch, & Birditt, 2014). Typically, it is found that individuals with more social ties or with better integration of social ties would have longer life particularly concentrating on the aged population. Moreover, quality of social ties also plays a significant role, one study found that better well-being is found in elderly who reported with qualitied social ties than those reported with more numbers (Blazer, 1982). Interestingly, as most research supported that subjective well-being is not reduced or even enhanced as one age, this phenomenon is labelled as 'the paradox of aging' since it is commonly thought that when

people age, the decline in physical health would lead to reduction in well-being (Mroczek &

Kolarz, 1998). Research implied that there could be underlying components such as emotional

and psychological support that linked with well-being of the elderly.

Different researchers have adopted different ways to measure social networks. One of

the well-known scientific ways to investigate social relationships is the use of convoy model

developed by Kahn and Antonucci (1980). The word convoy is coined by anthropologist Plath

(1980) to capture the members in protective layers surrounding the individuals and how these

members aid the individuals to encounter challenges in life span. With reference to this idea,

Kahn and Antonucci (1980) further elaborated the idea and defined it as the term "to capture the

life span and life course nature of social relations, with a special emphasis on emotional

closeness" (Antonucci et al., 2014, p. 83).

Theoretical background of the Convoy Model

One of the reasons of taking convoy model to investigate social relations is the simplified

representation of very complex human relationships. Within the convoy model, individuals are

surrounded by multiple social partners who give support as well as challenges across life span.

These relationships could diversify in terms of the closeness, quality, functions and structures.

This diversity allows changes across time and is affected by personal and situational factors.

With reference to Plath (1980), convoys keeps on changing and are important to provide support

to the elderly. For convoy measure, it can be measured objectively by summing the number of

relationships and/or via subjective evaluation of perceived social support. One effective way is

to create a profile where three concentric circles placed with respect to the level of closeness

ranging from close, closer, to the closest. The closest convoy members usually include family

members and best friends (Antonucci, Akiyama, & Takahashi, 2004).

Social Support

In terms of social support, it could be simply defined as the provision of help and advice by significant others (Parker & Barnett, 1987). There are two main types of social support, structural social support and functional social support, the former one refers to the existence of social ties and latter one refers to the availability of resources so as to achieve certain demands (Cheng, 2009). Kasprzak (2010) provided five indicators for structural support which were social network size, consistency and homogeneity, density, frequency and availability of contact. These indicators are referring to some fundamental features of the social relations. The author continued to distinguish functional social support into three types, namely, emotional support, instrumental or practical support and social integration. The importance of reciprocal relationship between social supports is discussed, stressing that both providing and receiving support are equally essential (Cheng, 2009).

The Convoy Model devoted the theoretical development in several ways. First, it took a holistic way to conceptualize social relations. With earlier studies emphasized on the quantity of social relations followed by the quality of them, Convoy Model has taken both sides for consideration (Antonucci et al., 2014). Specificity is another advantage of adopting Convoy Model in research studies. It allows researchers to focus on the specific relationship types and their relevant features such as the frequency of contact for each member. This model prevents the under- or over-estimation of the social relations since it allows the separated analysis of different relationships types. Since this model is built with the foundation of life course perspective, it tolerates the possibility of the dynamics and changes across time and events. This perspective allows researchers to understand more about how the social relations change within subjects or between groups.

Research findings from Convoy analyses

The original study using Convoy Model to study the social relations of the elderly could be traced back to 1980s (Antonucci & Akiyama, 1987). Subsequently, a multitude of studies fully or partially adopt their model has been done and a considerable amount of studies have been done in investigating the association between subjective well-being and the convoys of elderly.

Berkman and his team (2000) has provided a conceptual model on how social networks influence individual's well-being through social support. With this foundation, Thanakwang, Ingersoll-Dayton, and Soonthorndhada (2012) conducted a study to investigate the relationship between social networks and social support to psychological well-being among older Thai individuals. They found that social support in terms of support from family and friends mediates the effect of social network and psychological well-being among the older adults, besides, family support is the most significant predictor.

There were also early findings supporting the variation existing among different gender. For example, Connidis and Davies (1992) reported that women had more friends than did men. In addition, women might report more negative and positive relations than do men, this suggested that women might possess worse network profiles (Antonucci, 2001). The gender differences seem to be strength and weakness in social relations. For instance, women with greater social networks rated significantly unhappier than those who had smaller social networks (Antonucci, Akiyama, & Landsford, 1998). Satisfaction as well as burden could simultaneously exist especially to those who possess larger networks. On the other hand, men tend to have smaller networks might feel less responsible and less burden from the network. Yet, this postulate still requires further exploration.

Typology of social network

Previous research regularly reported the powerful impact of social relations on mental health although many of them used a single indicator for examination (Fiori, Antonucci, & Cortina, 2006). They criticized that by adding individual aspects of networks might lead to overs-simplification on understanding the relationship between network features and well-being. An alternative way to investigate this relationship could be examining the types of social networks among older adults (Bosworth & Schaie, 1997). It is postulated that there could be distinctive variations in patterns of social relations as well as their ways to interact with others among older adults, using network typologies could be able to identify their adaptive features among clustered types of networks (Adams & Blieszner, 1995).

The construct of social network type could show diverse levels of social capital. Older adults could maintain or reduce certain level of social ties which could be shown under the scope of social capital. This could be expressed by examining different target variables within the given social network type. In other words, each type of social network should possess an array of characteristics or features.

Research findings from typological studies

To my knowledge, there have not been large quantities of studies done on investigating social network typologies among older adults. The first systematic research could be traced back to Litwin. His aim of the research was to classify different network types among older adults and to analyse the association between identified types and morale. In his study, five types of social network were found which were the 'diverse-type', 'friend-oriented type', 'neighbor-oriented type', 'family-oriented type' and 'restricted-type'. His study showed that older adults in diverse or friend-oriented type had the greatest score in morale. Based on this preliminary

finding, Fiori and colleagues applied the notion of social network typology and discovered the relationship between social network typology and mental health among older adults in United States (Fiori et al., 2006). Four network types were identified which were 'diverse', 'family-focused', 'friend-focused' and 'restricted' networks. It is found that depressive symptoms were prevalent among older adults with non-friends network and were lowest for those in the diverse network.

Besides, variations exist in types of social network across cultures. For instance, restricted network type was further differentiated into 'non-family restricted' and 'non-friend restricted' in Fiori's study (Fiori et al., 2006). In Germany, two sub-types for friend-focused type and restricted type were shown (Fiori, Smith, & Antonucci, 2007). In Asian county, two supplementary network types were identified in the study done in Israel (Litwin & Shiovitz-Ezra, 2006). Another distinct type named as 'married distal' was emerged in Japan cohorts (Fiori, Antonucci, & Akiyama, 2008). In Hong Kong, four prevalent types of network were also found, the fifth type named as 'distant family' was featured by its focus on distant kin which was considered as a particular aspect in Chinese society (Cheng, Lee, Chan, Leung, & Lee, 2009).

Studies have shown that different network types could predict mental and physical health variables. For example, two types of network were significantly associated with morale after controlling socio-demographic variables (Litwin et al., 2006). Individuals who possessed greater social capital in regard to network types were found to be associated with better psychological well-being in terms of lower ratings in loneliness, anxiety and higher rating in happiness (Litwin & Shiovitz-Ezra, 2011). Among Hong Kong cohorts, 'diverse' and 'family-focused' networks were characterized by the highest well-being indicators while 'restricted' networks had lowest scores in life satisfaction and positive affect but highest scores in depression and negative affect

(Cheng et al., 2009). Evidence from this domain highlights, as a whole, that older adults who possess greater social capital in terms of number of approachable members, contact frequency and social support, tend to experience better psychological and physical health and well-being.

Socio-emotional Selectivity Theory (SST)

While the Convoy Model is applied across life span, Socio-emotional Selectivity Theory (SST) captures more about the elderly adulthood. According to Carstensen (1992), this theory stated that when we get older, we would pay more efforts in investing meaningful social relationships. The reduction in interaction is seen as an active process of selecting appropriate size of network so as to maximize and minimize social and emotional gains and loss respectively. Charles and Carstensen (2010) explained that with increasing age, people would perceive the limitation of time as crucial, which induces old people to prioritize the resources to achieve attainable goals as well as to gain emotional meanings. The perceived time is more important than the chronological age. It is supported by one study done by Carstensen and Fredrickson (1998), participants were asked to mentally represent their social partners, and results were similar among old people and young males with Human Immunodeficiency Virus who are likely to die soon. Another comparative study also reflected that older adults tended to view themselves with limited future time, they would prioritized their goals related to generativity, emotion regulation and autonomy (Lang & Carstensen, 2002). It is further accounted that the motivational shifts due to the time constraints are the adaptive measure and with benefits per se. Lockenhoff and Carstensen (2004) provided one pathway of interpretation of the better well-being of older adults while the alleviation of network size is observed. They justified that aged individuals would tend to pay more attention to the emotional aspects of situation when time is limited, and would adopt a more emotion-focused approach over pragmatic way of coping.

Therefore, old adults would choose to satisfy innate over novel social contacts, this adaptive behavior leads to a more gratifying view of social support and associates with better well-being. In sum, SST is a resonating theory with S-O-C, they both assumed that older adults would still pursue their goals but different from the way that younger adults do due to the limited time resources. S-O-C is a broader theory in achieving successful aging while SST tends to focus on goals pertaining to social relationships and their corresponding emotions (Penningroth & Scott, 2012).

Social participation

Definition of social participation

The role of social participation among older adults has been explored. However, there have been major critiques on Activity Theory in terms of logical, empirical and pragmatic inadequacies (Ritchey, Ritchey, & Dietz, 2001). They complained that the clarity of conceptualization of social participation is insufficient and unilateral resulting in inconsistencies and weak findings empirically, therefore, studies regarding prediction of psychological well-being by social participation should be cautious. Despite the argumentative voice on this theory, researchers are still embracing the idea of better psychological well-being are found in active old people. As scholars opined that social participation in older adults might be different from those who are younger since older adults would spend more time on different activities given that less time is spent on structured activities such as work (Levasseur et al. 2010).

From a micro view, some scholars argued activity types may influence well-being differentially. Warr, Butcher, and Robertson (2004) indicated the need of separating simple daily activities from social participation. As echoed by a study, activities, with a routine nature such as cooking and cleaning, could maintain the functioning of a person, but the amount of

participation showed no correlation with life satisfaction (Herzog & Rodgers, 1981). It is suggested researchers should focus on self-determined activities which are expected to contribute to one's psychological well-being (Warr et al., 2004).

Furthermore, there is a range of differential terminologies used to define social participation even within the same field. For instance, the World Health Organization (2007, p. 9) has provided a definition of social participation as "the engagement of older people in recreation, socialization, and cultural, educational and spiritual activities. Revisiting the literature, scholars usually allied social participation with other terminologies such as social inclusion and social capital. Some researchers defined it as taking part in formal groups and associations (Ellaway & Macintyre, 2007), or individual or group actively participates in societal activities within formal and informal groups (Hyyppä, Mäki, Alanen, Impivaara, & Aromaa, 2008), or a set of collective activities which were carried out by individuals as a part of daily life (Brodie, Cowling, & Nissen, 2009). From all these definitions from the literature, the commonality lies within the scope of activities regardless of types. By reviewing definitions adopted in the literature, Levassuer's team conducted a systematic review regarding aging population and social participation (Levasseur et al., 2010). They found there are terms used interchangeably within the scope of 43 formative definitions such as participation, social participation, social engagement, community involvement and so on. With a more comprehensive review, they found that social participation should be attributed to different levels of involvement in the society by adopting a taxonomy of social activities. They defined social participation as "a person's involvement in activities that provide interaction with others in society or the community" (Levasseur et al., 2010, p. 2148). The most significant contributions to this definition are, first, it separates concepts of social participation from participation and social

engagement, second, it emphasizes on human interactions implying that activities without social interactions should not regard as a kind of social participation.

Meanwhile, the operationalization of activity has also been unstable across studies. (Ritchey et al., 2001) pointed that most of the studies have adopted the definitions of activities proposed by Lemon, Bengtson, and Peterson (1972). Lemon et al. (1972, p. 513) defined activity as "any regularized of patterned action of pursuit which is regarded as beyond routine physical or personal maintenance". They categorized activity into solitary, formal and informal activity and emphasized the intimacy of interactions as the foundations to constitute the psychological well-being. Initial findings recommended researchers to revise the activity particularly related to the informal social activity aspect since well-being is influenced less in formal or solitary activity (Adam et al., 2010). Other researchers have classified activities in different ways according to their research interest, for example, (i) formal, informal and general activities (Okun, Stock, Haring, & Witter, 1984), (ii) paid, unpaid works and attendance of meetings of social groups (Hsu, 2007); (iii) unpaid and leisure activities (Census and Statistics Department, 2015). There could be large between-study variation based on this different categorizations. The aforementioned critics concluded that it would be difficult to compare and generalize studies since they might capture different aspects in term of social participation and development of measurement of social participation would also be ambitious (Levasseur, Desrosiers, & Tribble, 2008).

Measurement of social participation

Activity is a broad term encompassing different forms and usually be measured in the light of amounts or patterns (Atchley, 1995). Based on the categorization proposed by Lemon et al. (1972), relatively meagre number of studies have investigated the effect of solitary activities

on psychological well-being due to the possibility of the difficulty on defining solitary activity (Ritchey et al., 2001). In general, it is a common practice for scholars to measure the frequency of participation from a list of activities. Then a composite score or aggregate frequency score would be calculated and the level of participation would usually be reflected by that summarized score. For example, Baker et al. (2005) have generated two indexes of productive activities, a composite score of total number of productive activities engaged and a composite score of the total time committed to all productive activities, and used these two scores to predict happiness. Some scholars would adopt the idea of categorizing different activities into smaller number of groups or activity types through statistical measure. Leung, Leung, and Lam (2011) have classified leisure activities into four groups based on the results from the focus groups. The identified activities were intellectual, social, recreational and physical activities with an array of items in each domain, each activity domain was measured with three indicators, the total hours spent per week, total frequency and total number of subtypes. Specifically, the frequency of the each activity was then recoded with an assigned number, for example, 0.5 point indicating the activity is carries out bi-weekly. They used the leisure activity scores to carry out logistic regression to investigate how activity groups are associated with global cognitive decline. Similarly, Warr et al. (2004) used a list of activities and trimmed down into six factors with seventeen activities through factor analysis, mean frequency was calculated using six factors structure and computed as overall activity score for further analysis. Other eclectic scholars took a simpler measurement by counting the total number of activities participated during the past week by asking whether the participants have had participated in certain activities and creating a score of the total number of activities engaged (e.g. Litwin & Stoeckel, 2016; Newall, Chipperfield, Clifton, Perry, & Swift, 2009).

Typology of social participation

There have been a couple of studies done aiming at exploring clusters among activities in older adult generation. These studies were done in western countries with most findings suggested that there were 4 or 5 clusters in their cohorts. For example, a five-cluster solution was found in a study of activity profiles among older adults in USA, which were (i) Low Activity, (ii) Moderate Activity, (iii) High Activity, (iv) Working and (v) Physically Active (Morrow-Howell et al., 2014). Results suggested that low-activity participants were the most vulnerable group to health and depressive outcomes while high-activity group may act as representatives of active aging.

Another study also revealed a five cluster structure in Netherlands (Croezen, Haveman-Nies, Alvarado, Van't Veer, & De Groot, 2009). They were (i) Less Social Engaged Elderly, (ii) Less Social Engaged Caregiver, (iii) Social Engaged Caregiver, (iv) Leisure Engaged Elderly and (v) Productive Engaged Elderly. Their results reviewed that the most prevalent group came to Leisure Engaged Elderly and Productive Engaged Elderly, and they were mostly with better physical and mental health indexes. They further suggested that the public health sectors could target those who were relatively less active for future interventions.

Mechanisms and benefits of social participation

The relationship between social participation and well-being of older adults are well-established. Although social participation could be decreased with age due to changes across life span, social participation is still embedded as one of the positive determinants to successful aging or healthy aging (Lee, Jang, Leeb, Cho, & Park, 2008). Scholars carried out a series studies to look into its mechanisms, the most obvious and direct one is related to physical health. Activities provide stimulation to physical body which foster a wide range of motions and

movements (Adams et al., 2010). For example, one study showed that older adults, compared to younger adults, improved significantly more in self-rated health indicator as a result of voluntary work (Willigen, 2000).

Mentally, social participation could enhance social support in which older adults could receive more emotional closeness and instrumental assistance, which in turn foster better well-being (Aquino, Russell, Cutrona, & Altmaier, 1996). Lazarus and Folkman (1984) further discussed that social support could lessen stress as it provided older adults with chances of cognitive reappraisals, re-thinking and interpreting the stressful situation to be less stressful. Social support could also be gained via social interactions that establish a sense of belonging and positive attachments. Intense interactions allow older adults to exchange information that could be associated with health-related behaviours (Berkman et al., 2000). Social participation could also acts as a protective factor for social isolation or loneliness, this relationship is more salient in productive activities.

On a personal level, as echoed by Activity Theory, active engagement in society allows older adults to maintain and consolidate their role within social circles, this could further develop a sense of meaning or purpose and a sense of identity (Atchley, 1989). To recap again, activity participation also involves goal achievement, success in achieving personal goals indicates a sense of autonomy and mastery as well as accomplishment (Lawton et al., 2002).

Within the scope of gerontogical study, well-being is usually defined as the subjective counterpart of evaluation of successful aging, which usually includes terms of happiness, affect, quality of life and life satisfaction (Stanley & Cheek, 2003). It also involves other health-related indicators such as self-rated health and longevity. The impacts of social participation on well-being have been demonstrated in a wide range of studies, for example, social participation could

enhance quality of life (Levasseur, Desrosiers, & Noreau, 2004); longer survival and less likely

to develop depression (Glass, Leon, Marottoli, & Berkman, 1999); reduced risk of developing

dementia (Wang et al., 2002); postponed decline in muscle performance (Svanborg, 2001) and

enhanced ratings in happiness and life satisfaction (Baker et al., 2005; Hsu & Chang, 2015).

Another steam of research has emphasized the relationships between social participation

and cognition. Given that cognitive decline is inevitable when people age, however, the rate and

timing of this decline could be postponed individually (Christensen, 2001). In fact, some

cognitive functions will remain intact across life span, for instance, the general knowledge, while

some of them decline with respect to time such as processing speed (Deary et al., 2009).

Various common risk factors, usually pertaining to health aspects, are identified for cognitive

decline such as smoking habit, intemperate alcoholic abuse, presence of cardiovascular diseases

and diabetes (Beydoun et al., 2014). Kuiper et al. (2016) have conducted a systematic review on

how social indicators act as risk factors to cognitive decline. The meta-analysis results focusing

on the social relationships revealed that structural, functional and a mixture of both aspects were

correlated with cognitive decline. Specifically, for the structural part, small social network

contributed the greatest impact to cognitive decline, followed by the factor of low social activity.

For the functional dimension, the factor of being lonely and with low emotional support

suggested the influential impacts to cognitive decline.

Hultsch, Hertzog, Small, and Dixon (1999) has provided the idea of 'use it or lose it', in

which they proposed the brain is like a muscle, engaging in activities and social network could

stimulate the brain, on the contrary, disengagement leads to obsolescence of the brain and its

related functions that associated with deterioration. Two causal models, the main-effect model

and stress-buffering model, could account for the social relationships and the advantageous

outcomes (Kawachi & Berkman, 2001). The main effect model suggests the social networks provide social influences that guiding the individuals with appropriate behaviors. They also enhance positive psychological states and self-worthiness which promote motivations for better self-care and modulate the neuroendocrine response to stress. With the extensive social structure, individuals gain different forms of support that could be the protective factors of distress. The stress-buffering model assumes social support could modulate or even prevent detrimental effects to health under stressful events. Perceived or received support could alleviate the negative reactions or inhibit or suppress undesirable responses to stress. Kuiper et al. (2016) stated that the main-effect model is applying on interpreting structural aspect while the stress-buffering model is accounting on the functional side.

The influence between elderly participation on cognitive functioning and well-being has been investigated recently. Higher frequency in participation in numerous activities is found to be a protective factor against dementia (Fabrigoule et al., 1995). Another study supported that social participation is associated with life satisfaction and better functions (Jang, Mortimer, Haley, & Graves, 2004). From the studies of Taiwan population, higher cognitive functioning is associated with better social support as well as greater social participation in activities (Yen, Yang, Shih, & Lung, 2004). Hsu (2007) has researched on the relationship between social participation and mortality as well as cognitive impairment. Interestingly, he found out that doing unpaid work would associate with greater cognitive impairment and joining political group for men could reduce the risk of that. He concluded that doing unpaid job does not require cognitive loading that cannot preserve cognitive functioning.

Interim conclusion regarding social network types, social support and social participation

Social participation involves interactions between people, groups or organizations which could affect social network, social support as well as sense of community of individuals. This chapter has reviewed the literature on social network types and typologies of network among older adults, in general, those who have diverse network seemingly benefit most in physical, social and psychological outcomes. Although theories including SST and S-O-C suggested older adults could reduce their interactions with others, it is not necessarily equivalent to disengagement to the society or social members, on the contrary, studies consistently supported that socially active aged adults are superior to those who are relatively inactive in all aspects of life. Potential mechanisms, namely, health-domain, social-support-domain and personal-domain were also explored.

Ageism and age stereotypes

Revisiting the ideas of social indicators among older adults, social participation resides paramount position in determining successful aging, meanwhile, effects on self-perceptions of aging have been raised (Wurm & Benyamini, 2014). Given that the well-being of older adults could be promoted by explicit social factors such as enhancing social participation and boosting social support, likewise, well-being could be degraded by other social psychological factors, age stereotypes has been regarded as one of the catchy factors to be investigated by gerontologists in recent decades. With the substantial and rapid growth of the aging population, this population will be accompanied by continued, and increasing, demands for aging and gerontology services and can also present more opportunities from different sectors of people in interacting with older adults (Doron & Apter, 2010). On the one hand, older people are found to maintain health and well-being through social interactions, on the other hand, some studies indicate that older adults have a low image of themselves, for example, they expressed prevailing feelings of loneliness

and isolation and often stated they were waiting for death which was directly affecting their physical, mental and psychological health, even though this cohort of older adults tended to be more educated, more health-conscious, and financially independent (Dionigi, 2015; Levy, Slade, Kunkel, & Kasl, 2002; Nelson, 2005; Robertson, King-Kallimanis, & Kenny, 2016). In addition, studies tended to support that the younger generation has a more negative perception of image of old age as compared with the perception held by aged respondents. Negative descriptions associated with elderly ranged from personality traits to physical or socio-demographic status including poverty, slow motion, fragility and health deterioration, selfishness, self-centeredness, stubbornness, loneliness, etc. (Bargh, Chen, & Burrows, 1996; Kite & Johnson, 1988). These negative justification and evaluation of one's behaviors or attitudes with reference to the age is defined as ageism (Nelson, 2002). It is postulated the fears are manifest to young people who possess high self-esteem as they do not want to become one of the fragile elderly. As a result, distinctive defense mechanisms would be employed so as to derail themselves from the elderly in all conditions. It is also alert that ageism somewhat forms a vicious cycle since the younger generation would normally come across all life stages and reach the latest stage in which they would become one of the discriminated people who might experience the same negative impacts.

Although ageism is still inevitable globally over the past couples decades, it seems more work is required perpetually rectification which helps to minimize the risk factors of health in older adults and the economic impact of the community in the long run (Nagarajan, Teixeira, & Silva, 2016). For example, fertility rate dropped may reduce the cost for the young including education, but advanced medication and technology extended the life of older adults with poor mobility which, in fact, increased the cost of institutionalized and other elderly services. Furthermore, the quality of old age is determined by how older people are treated. Individuals

should have the chance to age with independence, dignity and purpose. People from different

generations should be linked by a commitment to shared values, community and services.

Age stereotypes

As discussed above, ageism refers to aged-driven stereotyping, discrimination and

prejudice whereas aging stereotypes are the commonly practice of treatment to individuals or

groups based on their age (Kogan, 1979). Researchers clarified that the aging stereotypes

referred the cognitive aspect of attitudes toward older adults, while affect and behavior were led

through prejudice and discrimination (Cuddy, Fiske, & Glick, 2007; Zebrowitz, 2003). These

three dimensions of attitudes formed and represented the facets of ageism as a whole. Generally

speaking, age stereotypes are a constellation of beliefs or expectations of the characteristics and

traits of aged individuals (Toomey & Rudolph, 2015).

Allport (1954) indicated that children's prejudice are normally taken through their

culturally stereotypes from their family. Likewise, aging stereotypes as well as stereotypes of

gender and race are developed and expressed across life span. According to Levy (2003), age

stereotypes are internalized from childhood and they start emerging until late adulthood, which

start interfering individuals and turn into self-stereotypes. These self-stereotypes could affect

individuals subtly or blatantly. Moreover, negative age stereotypes concerning cognition and

memory are found in common among different age groups (Hummert, Garstka, Shaner, &

Strahm, 1994). Another study also indicated that the young and older adults possibly hold the

same stereotypes of aging (Heckhausen, Dixon, & Baltes, 1989). Their findings revealed mainly

on their frame of reference related to people they have known longer, rather than the general

public, disregarding their socioeconomic status, educational background and life experiences,

even in their same group members. In short, aging stereotypes begin early in childhood stage

and exercise over the lifespan repeatedly.   One insightful message should be noted that older adults would be willing to share their basic beliefs and expectation, no matter those are positive or negative, among their in-group members.

Age stereotypes are thought to be more perpetuating since they might be more tolerable in the society and disclosing such kinds of negative aging stereotypes may usually not lead to any negative sanctions (Levy & Banaji, 2002). Kornadt and Rothermund (2011) suggested that we should be cautious in interpreting views of older adults and how they view themselves as well since they are complex, dynamic and with different dimensions. Meanwhile, stereotypes of aging are not always negative, they could be positive depending on the cultures, situational history and personal life span.

Manipulation of age stereotypes in studies

Researchers have taken efforts in researching and examining the role of age stereotypes as well as stereotype threat on aged adults, specifically on cognitive aspect, as it is the most frequent complaint made by older adults. There were various innovative methods to activate age stereotypes in different experiments.

Manipulations of stereotypes differ across studies, for instance, stereotype threats are elicited simply involving participants to identify their race (Steele & Aronson, 1995), reminding participants of the negative stereotypes of their group deliberately (Aronson et al., 1999), showing a video with unbalanced gender ratio (Murphy, Steele, & Gross, 2007) or asking the participants to identify group differences (Keller & Dauenheimer, 2003). Apart from these manipulations, using experimental design and priming task in laboratory settings have become prevalent in particular to investigation of effects of age stereotypes among old adults. This

priming task was originated from Levy's classical experiment and has been broadly adopted later for further investigation (Levy, 1996). Among different manipulations, in general, it is found that the age stereotypes tend to be more powerful when cues are moderately shown, stereotype-based, negative and task-relevant (Levy & Leifheit-Limson, 2009; Meisner, 2011; Popham & Hess, 2013).

Effects of positive age stereotypes

The results of positive age stereotypes on health and cognition of the older adults are found to be mixed. This could suggest that effects brought by positive age stereotypes could be speculated as either more complicated or indeed with no effects at all (Dionigi, 2015). Empirically, Levy and her colleagues have manipulated an array of experiments by using implicit positive prime to show the improvement in performances in different domain such as memory (Levy, 1996); walking speed and percent swing time (Hausdorff, Levy, & Wei, 1999) and even willingness to live (Levy, Ashman, & Dror, 2000). Another study showed that there was no significant improvement shown in the cardiovascular stress among older individuals primed positively, researchers have deduced that positive primes could act as a buffer to counteract the negative effects of negative age stereotypes and suggested that inducing positive age stereotypes could be a possible way for cardiovascular stress reduction (Levy, Hausdorff, Hencke, & Wei, 2000).

Experimental studies, though not sufficient enough, were also carried out in explicit priming condition. One study reflected that elderly whom are explicitly positively-primed, compared with neutrally-primed group, showed better job-related performance (Kirchner, Völker, & Bock, 2015). Dionigi (2015) remarked there is insufficient support on how explicit positive age stereotypes contribute to long-term effects in cognitive and physical performances.

Effects of negative age-stereotypes

A greater focus has long been put on investigating the relationship between negative age stereotypes and their related effects in line with Levy's experimental design. Negative effects on subliminal priming of older adults are found to be sturdy among Levy's studies, these negative outcomes encompassed heightened cardiovascular stress (Levy et al., 2000); reduction in walking speed and swing time (Hausdorff et al., 1999); worsened memory performance (Levy, 1996); refusal of taking life-prolonging interventions for living (Levy et al., 2000). The effects of age stereotypes across cultures have also been explored (Levy & Langer, 1994). They discovered that American adults with normal hearing possess the least positive views of the aging process compared to those who are deaf and Chinese older adults. Subsequently, they also found the worst memory performance lied in the former group. Although other scholars did not replicate the similar results, some argued the discrepancy is attributed to the different memory tests (Yoon, Hasher, Feinberg, Rahhal, & Winocur, 2000). Counting on Levy's inventive work, diverse studies have replicated that implicit negative age stereotypes priming would lead to unfavorable impacts on memory, psycho-motor, physiological and social components (Meisner, 2011). For example, a study replicated Levy's paradigm and revealed that those who are negatively primed and unaware of the primes would perform the worst (Stein, Blanchard-Fields, & Hertzog, 2002). A study has examined whether the stereotypes predict memory over time given previous findings only support the short term effects (Levy, Zonderman, Slade, & Ferrucci, 2011). They determined that older adults with more negative age stereotypes performed significantly worse than those who have less negative age stereotypes. They stressed that the strong effects of negative age stereotypes are so robust. This finding echoed with the idea of older adults are consistently exposing to negative stereotypes in everyday settings which would

activate the internalization of these negative age stereotypes cyclically (Levy, Chung, & Canavan, 2011).

Explicit priming of negative stereotypes were used through different manipulations, for example, reading a positive or negative news articles of aging (Hess, Auman, Colcombe, & Rahhal, 2003) or framing the task so as to induce the negative age stereotypes explicitly (Rahhal, Hasher, & Colcombe, 2001). Wheeler and Petty (2001) carried out a review and illustrated that most studies considered the stereotype threat theory through investigating memory and cognitive performance especially asking participants to re-call words or objects. Apart from these aspects, stereotype threats have been shown to alleviate mathematic performance and general cognitive ability as well (Abrams, Eller, & Bryant, 2006).

Some authors have done two studies to compare the effects of implicit and explicit priming of aging stereotypes (Hess, Hinson, & Statham, 2004). They used the scrambled sentence task to activate stereotype by asking participants to form a grammatical sentence using four out of five words. They allocated participants into four groups by two category, priming valence and awareness of condition. For the awareness manipulations, participants in the aware group would be given age-related words highlighted in yellow while those in the unaware group received normal cards. Their results show that significant poorer memory performance is found only in negatively and implicitly primed group.

A meta-analysis has been done on the effects of how age stereotypes were correlated to different performances of the older adults (Horton, Baker, Pearce, & Deakin, 2008). Given the fact that the review did not include unpublished studies and only involved studies mainly adopted from Levy's and Hess's work, they still found the weighted effect size of the negative stereotype on older adults' performance as $d = .38$. Meisner (2011) also reviewed over a

hundred articles and found a significant main effect for prime valence, indicating that negative age stereotyping elicit stronger impact, about three times, on essential behavioral outcomes among older adults than positive age stereotyping or neutral controls.

Although the effect size seemed not so vigorous, Popham and Hess (2013) have drawn two implications regarding this issue. The first point was pertaining to the potential for continuous exposures to these negative age-stereotype primes, consistent exposure to negative age stereotypes would not only lead to the physiological arousal but also withdrawal from active participation. As illustrated by Popham and Hess (2015), disengagement of activities related to memory is a result of avoidance of threat but it could negatively affect one's memory ability since it is not practiced. Another implication was concerning about assessment particularly for those who carry out assessment. They exhorted practitioners to mind their words especially related to age stereotypes since above studies evidenced the strength of subtle primes.

To summarize, priming manipulation could be adopted in both explicit and implicit way. Experimental design is a common way to mimic the real world situation. Cognitive and memory tests are the most obvious outcome measures for activation of age stereotype in older adults, with those who are implicitly primed with negative age stereotypes showed the worst performance while inconsistent results have been found for those who were positively primed regardless of levels of awareness.

Mechanisms of age stereotypes

It is necessary to distinguish between the effects of stereotype threat and stereotype priming on performance outcomes. Stereotype threat emerged at a conscious level, this threat could generate a feeling of threat specific to the target group when those particular stereotypes

are concerned. Moreover, these threat effects are multiply mediated by cognitive, affective and motivational processes within individuals (Steele, Spencer, & Aronson, 2002). Impacts of age stereotypes seems to be a more general process, it could be attributed by the cause of stereotype activation (Shih, Ambady, Richeson, Fujita, & Gray, 2002). Therefore, in this section, the mechanisms of stereotype threat and priming aging stereotypes would be distinguished.

Studies have tried to capture the effects of stereotype threat via a set of mediators including affective and subjective mechanisms. The original study done by Steele and Aronson suggested that self-reported anxiety to be a significant mediator of the effect (Steele & Aronson, 1995). However, they found that this variable was not a significant mediator of the effects of stereotype threat on women's mathematics performance. Further studies also revealed the similar direction (Aronson et al., 1999; Keller & Dauenheimer, 2003). It is further argued that anxiety might be one of the other mediators that account for the effect of stereotype threat, for instance, a study reported that there was a sequential mediation of self-reported anxiety and self-efficacy of the effects of stereotype threat on exam performance (Chung, Ehrhart, Ehrhart, Hattrup, & Solamon, 2010). Some researchers also adopted objective measures of anxiety taking physiological indicators as an indirect measure. Not surprisingly, there were also mixed results on objective indicators with a study revealed the relationship could be mediated by physiological anxiety while other studies did not replicate similar results (Bosson, Haymovitz, & Pinel, 2004; McKown & Weinstein, 2003) These studies have questioned the role of anxiety in affecting stereotype threat impact, and yet, anxiety could be somehow thought as a potential mediator of other indicators.

Nevertheless, the way we perceive whether our personal resources could be able to achieve success in tasks might play an important role. This is consistent with the idea of

performance expectations. Personal resources are usually associated with group-level expectations, in-group threatening information could be detrimental to performance outcomes through lowering their expectations on achievement (Cadinu, Maass, Frigerio, Impagliazzo, & Latinotti, 2003). In their studies, they found that performance expectancies partially mediated the effects of stereotype threat on mathematic performance. In investigating stereotype threat in older adults, Hess and colleagues conducted complex studies and found evidence of education level as a moderator while the performance expectancies as the mediator (Hess, Hinson, & Hodges, 2009). Specifically, they found that highly educated older adults were more susceptible to stereotype threat. In line with this notion, other studies suggested that subtle cues could also affect performance expectancies. One study found that women performed worse in golf task when there was the presence of a male (subtle cue) or the task was framed as measuring gender differences (blatant cue).

Another vein of mechanisms focused on cognitive aspect, especially cognitive demands on the performance outcomes. One of the salient factors attributed to working memory capacity. Schmader and Johns (2003) postulated that working memory capacity was reduced when individuals encountered stereotype cues which demanded cognitive resources. Their studies revealed that working memory capacities were reduced among women and Latino when they were exposed to negative stereotype primes. Furthermore, the reduction in working memory capacity mediated the effect of stereotype threat on performance outcomes. Interestingly, results from another study showed that the performance decrements could be reduced when women were primed with positive and negative social identity at the same time (Rydell, McConnell, & Beilock, 2009). However, this relationship was not proven among older population (Hess et al., 2009).

Other researchers have depicted the impact of emotion regulation in explaining the underperformance (Johns, Inzlicht, & Schmader, 2008). It is argued that their cognitive load was high when individuals were placed with high demands of tasks as well as stereotype cues, for example, people might need to regulate their emotions when they confronted the negative stereotypes, this regulation required mental resources and depleted executive resources for performance outcomes. Other researchers suggested individuals might need to suppress their thoughts when they evaluate the stereotypes, such efforts to disprove the stereotypes demanded cognitive resources needed to perform successfully. A study has proved that when stereotype threat was high, their performance of an intelligence test would be poorer, moreover, this group of individuals also showed greater heart rate variability which was thought as the mental efforts of suppressing thoughts (Croizet, Després, Huguet, Leyens, & Méot, 2004).

Other scholars advocated a more positive view on these effects. They posited that individuals could engage in coping tactics to minimize the negative effects of stereotypes in the experimental settings. Cognitive appraisal was one of the researched items, it refers to the way individual evaluate the situation and their ability to manage it. Participants who appraised the situation more as a challenge than a threat had better performance on intellectual ability (Berjot, Roland-Levy, & Girault-Lidvan, 2011).

More and more recent work on the underlying mechanisms has been put on the motivational aspect. Extending the work on mere effort model, researchers found that participants showed poorer comparison problem performances when they were under threat (Jamieson & Harkins, 2007). They concluded that stereotype threat might motivate participant to perform well, yet, participants might still choose the dominant, but incorrect, approach to solve problems. Different problem solving strategies could affect performances on different

tasks and interpretation of results from other studies should be cautious. Among older generation, Hess and colleagues supported that the impact of threat on memory performance was partially mediated by strategy use (Hess et al., 2003).

Another perspective has focused on the motivation framework with reference to regulatory focus (Seibt & Forster, 2004). This perspective considers that when individuals were under stereotype threat, they would evaluate their best outcome by setting up a reference point that might involve a regulatory focus from gain-based to non-loss-based. As shown from their studies, the prevention-focused approach could be indexed by enhanced vigilance of avoiding making any errors, on the contrary, people would adopt a promotion-focused approach as indicated by enhanced eagerness, leading to faster performance but relatively more mistakes to be seen. Another study supported this notion, when older adults were placed under threat, they would adopt a prevention-focused tactic as indicated by enhanced accuracy and reduced speed (Popham & Hess, 2013).

The possible interrelated factors mediating the relationship between stereotype threat and performance outcomes have been reviewed. As mentioned, stereotype threat emerged at a conscious level, this threat could generate a feeling of threat specific to the target group when those particular stereotypes are concerned.

Stereotype Embodiment Theory (SET)

Priming aging-stereotype words to older adults was one of the common practices in experimental studies, however, the mechanism was said to be more general apart from the aforementioned detailed mediating mechanisms. Stereotype Embodiment Theory (SET) proposed by Levy has deliberately captured this effect (Levy, 2009). According to this theory,

aging stereotypes are internalized from young age and this internalization is assimilated by culture and socialization which in turn affect the wellbeing of older adults. The process of internalizing these age stereotypes is a continuous one across life span, younger cohorts would possess some negative age stereotypes, these negative age stereotype that they carry into later life, in the long-run, could hamper their well-being. A study done by Levy supported that negative age stereotypes possessed earlier across life span were associated with poorer health later in older adults. Another longitudinal study revealed that adults who possessed more negative age stereotypes at baselines were more likely to suffer from health problems after age 60 compared to those with more positive age stereotypes (Levy, Zonderman, Slade, & Ferrucci, 2009).

Most interestingly, a number of studies empirically proved that these age stereotypes, both positive and negative ones, could be activated beyond awareness, and could influence various performances among older adults. Subliminal age-stereotype studies revealed that, by flashing those age stereotypical words on screen, individuals exposed to negative age stereotype words showed poorer handwriting (Levy, 2000); less willing to live (Levy et al., 2000) and worse memory performance (Levy, 1996). These detrimental effects become dominant when individuals subjectively recognize that they are at the state of old stage. This identification promotes the effect through self-relevance, leading to the powerful effectiveness from age stereotype primes to age stereotype congruent behaviours. This phenomenon is reflected by studies on priming age stereotype primes to both younger adults and older adults, and then tested out their memory performance. Studies suggested that younger adults were inert to these age stereotype primes. However, older adults were impacted by these primes, which in turn showed activate their accessibility of behavioural schemas, leading to the greater tendency of prime-

congruent behaviours as indexed by poorer performances of memory tests (Lee & Lee, 2018). This could also be considered that the age stereotypes somehow generate anticipations which serves as self-fulfilling prophecies (Levy & Leifheit-Limson, 2009). In this study, older adults were randomly assigned to either positive-cognitive, negative-cognitive, positive-physical, or negative-physical subliminal-age-stereotype groups, all of them carried out both physical and cognitive tasks. Intriguing results suggested there could be a stereotype-matching effect, indicating that when the domains of age stereotypes corresponded to their task outcomes, the degree of impacts seemed to be maximized. They argued that this is a proof supporting their assumption of self-fulfilling prophecies.

Counteracting age stereotypes – the possibility of social factors

The prevalence of age stereotypes has been found in both East and West, although generally, it is found the perception of older adults tended to be more positive in the East than the West due to its cultural values including Confucianism and respect (Vauclair, Hanke, Huang, & Abrams, 2017). These Confucian values especially emphasize on filial piety could promote positive views of aging and socialize younger generation to respect and care for them (Sung, 2001). However, a cross-cultural study found that Hong Kong residents generally reported negative evaluations of older adults (Cuddy, Norton, & Fiske, 2005). The persistent negative view of aging could further loops and strengthen the vicious circle which directly or indirectly promotes negative age stereotypes. Thus, it could be asserted that the negative age stereotypes are rampant in our culture.

Although negative perception of age and age stereotypes could affect well-being, cognitive functions and psychological views of the elderly, some protective factors were identified as potential ways to counteract the detrimental effects. For example, it is found that

older adults with more negative perception of aging would tend to participate less in the society (Moser, Spagnoli, & Santos-Eggimann, 2011). Social engagement or social participation induces advantages to aged adults in the aspects of socialization, positive emotional development as well as cognitive development. Therefore, this stream of studies provides possible and innovative insights that elderly with greater social engagement could be less affected by negative age stereotypes as they tend to possess a more positive self-view, in other words, the internalization of negative age stereotypes would be less influential.

Ageism could be challenged and modified via encouragement. Ory, Hoffman, Hawkins, Sanner, and Mockenhaupt (2003) have suggested a list of strategies to cope with ageist stereotypes in the societal level, for example, launching public awareness campaigns and public education as well as raising public awareness on diminishing 'age myths'.

On the other hand, for individual aspects, encouraging productive roles and activities for older people as well as creating intergenerational networks are advised (Nelson, 2016). Increasing interactions with people could foster understandings of older generation contributing to amend the perpetuation of negative age stereotypes of them. It might also build up network for them to exchange support and resources. On the other hand, staying active and productive could be a magnificent way to change or counteract with negative age stereotypes. They could maintain or (re)-build roles and identities via engagement in activities. Furthermore, through social engagement, social support could be gained which has been found as one of the factors buffering aging negative self-perception of aging.

Interim conclusion regarding stereotype threat and primes

In this chapter, I have reviewed the ideas of age stereotypes, its mechanisms and the effects of both positive and negative age stereotypes in older population. Further discussing on age stereotype primes activated subliminally, the similar effects have been shown and explained by SET. Potential counteracting strategies were briefly introduced, a greater focus is put on the possible social indicator, primarily social participation. Thus, in this study, I predicted that older who were primed with negative age stereotype words would perform worse than the others, yet this relationship could be moderated by social indicator, older adults with greater social participation could be less likely affected by negative age stereotype primes as indexed by unaffected memory performance, which constituted the study 2 of this dissertation.

Chapter 3

Conceptual Framework of the Present Studies

Introduction

The preceding chapters provided an overview and foundation for this dissertation by reviewing related target variables in the literature. As reviewed, social participation plays an essential role to the well-being of older adults, the mechanisms of how it leads to better well-being is somewhat unexplored. Furthermore, as the Hong Kong society tends to be negative in perception of older adults, effects of age stereotypes should be examined to support this argument. This chapter encompassed the conceptual framework of the current studies for this dissertation. A model of social participation on health would be discussed and the conceptual models of the current studies based on that model will be presented.

Model of social participation on health

A recent study has been done to provide researchers with a possible model of social participation on health for further studies. Authors conceptualized social participation as three concepts, social connections, informal social participation and volunteering, they revealed that the relationship between social participation and health outcomes could be associated with other social variables through shared mechanisms of social support and social cohesion with the wider society (Douglas et al., 2016). Their conceptual model has been presented as Figure 3.1.

As shown in Figure 3.1, the effect of social participation on health is mediated by two indicators, social support and personal sense of community cohesion. Social participation could help older adults build and consolidate social capital, which in turn leads to higher perceived social cohesion and greater available social support. In other words, older adults could build up trust and be more likely to perceive the community could help them when they are in need.

First of all, the three aspects were identified as interrelated, for example, a study revealed that having more connections with significant members was associated with both informal social participation and volunteering, providing evidence of the positive relationships among all three aspects, which I conceptualized later as forms of social participation (Berry, Rodgers, & Dear, 2007). As reviewed above, these forms of activities have been found to be associated with psychological health and well-being, in general, the more active the older adults, the better the psychological health and well-being are likely to be (Berry, 2009). The key component of this conceptual model is that it involves a possible mechanism indicated by different paths; the authors suggested that social cohesion and social support could mediate the effects of social participation on health. As reviewed previously, social support is the types of assistance of help available to older adults whenever they need. Social cohesion, here, refers to the sense of reciprocity that the older adults possess within the community. These two factors were considered as more proximal indicators of health outcomes and have been support by previous studies (Pilkington, Windsor, & Crisp, 2009; Thanakwang et al., 2012). Social support, both structural and functional aspects, was taken to be the focus of the present thesis.

Although the word 'health' is used in the model, the authors admitted that it is a broad concept including psychological aspects such as mental health and well-being. Furthermore, Maass, Kloeckner, Lindstrøm, and Lillefjell (2016) have investigated the differences of impacts of social capital on health and life satisfaction. After controlling the socio-demographic variables, their structural equation models indicated that social capital exerted a larger effect on life satisfaction, explaining 46% variance of life satisfaction, while it only accounted for 23% variance of self-rated health. They concluded that building social capital could be a meaningful

strategy to foster life satisfaction in the community. Therefore, the present study adopts this

model to cultivate the present framework by substituting health into life satisfaction.
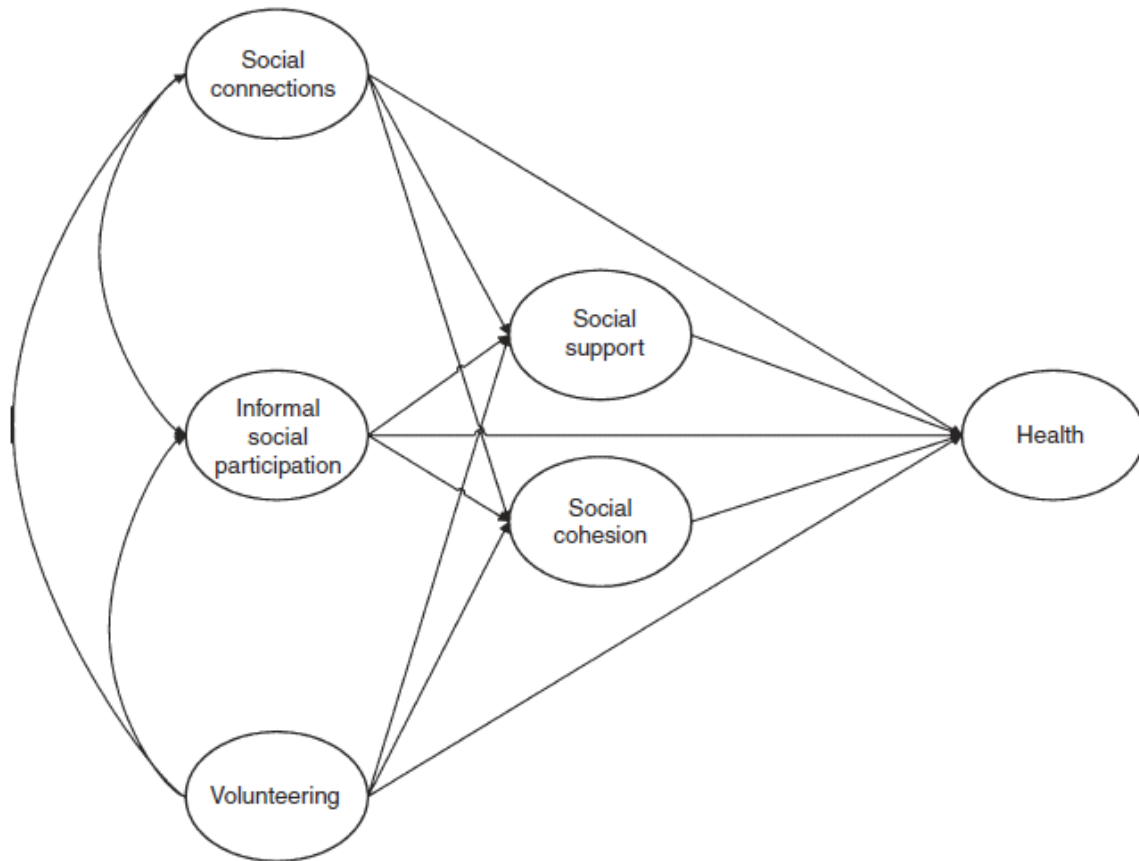
Figure 3-1 Conceptual model of social participation and social support adopted from Douglas et al. (2016)

Theoretical model of this dissertation and related hypotheses

A modified constructed theoretical model of this dissertation is presented as Figure 3.2.

This model intended to integrate several social indicators so as to unravel the effects of

interrelated mechanisms on the well-being of older adults. The well-being variable is indexed as

life satisfaction which is a common indicator of psychological well-being, it is chosen as the

outcomes as it is believed that life satisfaction is a long-term evaluative process instead of short-

term stages like emotions or affects, and is also believed as a way to reflect successful aging. The two main studies were done based on this constructed model and will be detailed the rationales and hypotheses as follows.
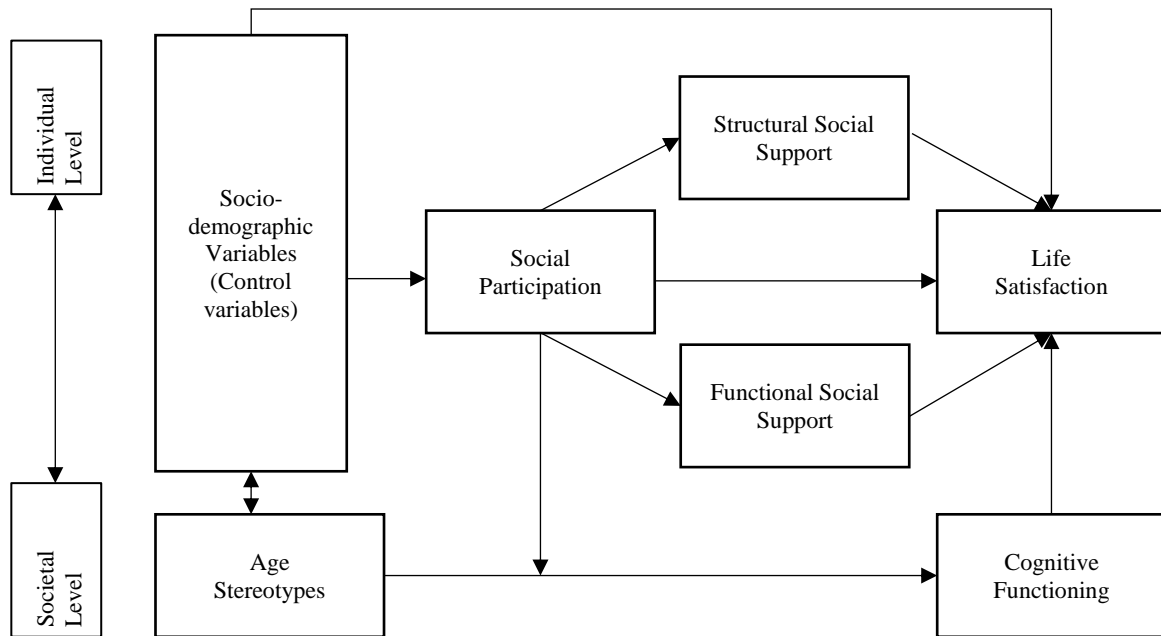
Figure 3-2 A modified constructed theoretical model of present dissertation

To echo with the research objectives stated in Chapter 1, two inter-related studies were conducted. Study 1a and 1b involves a cross-section study design, employed a large sample of eligible Hong Kong citizens especially community-dwelling older adults. Data were collected to describe and categorize the general profile of social participation in terms of activity types among participants, comparisons could be made according to the identified clusters and implications would be discussed.   Study 1a is done to achieve objectives (*1*)*(a) to categorise different types of sub-population based on the general profile of social participation in terms of activities of older adults* and (*1*)*(b) to examine any similarities or differences based on the identified clusters*. It is estimated that there should be a salient group of socially active

participants, anther salient group of socially inactive participants and other clusters ranged between these two polar groups. It is hypothesized that (H1.1a – 1.1b) socially active group should have significant larger network size and contact more frequently than the socially inactive group; (H1.2) socially active group should perceive with better social support than the socially inactive group; (H1.3) socially active group should be healthier than the socially inactive group; (H1.4) socially active group should be significantly satisfied with life than the socially inactive group.
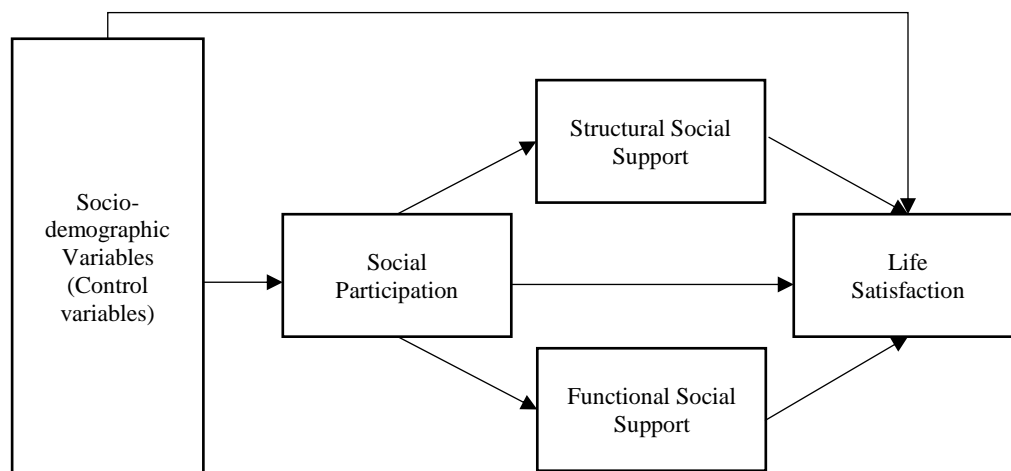
Figure 3-3 The constructed theoretical model of study 1b

Referring to Figure 3.3 as specific part of the proposed model, Study 1b is carried out using the same population for data analyses. Study 1b aims at achieving objective (*1)(c) to testify different models of how social participation contribute to life satisfaction*. After controlling for socio-demographic variables, it is hypothesized that (H1.5) social participation could be positively associated with structural social support in terms of social network size; (H1.6) social participation could be positively associated with functional social support; (H1.7) social participation could be positively associated with life satisfaction; (H1.8a, H1.8b) the relationship between social participation and life satisfaction could be mediated by both types of

social support. Furthermore, using different mediation models, the differential relationship, whether it is mediated in a parallel way or mediated in a serial way could be identified. These hypothetical competing models were generated in Figure 3.4 – Figure 3.6.
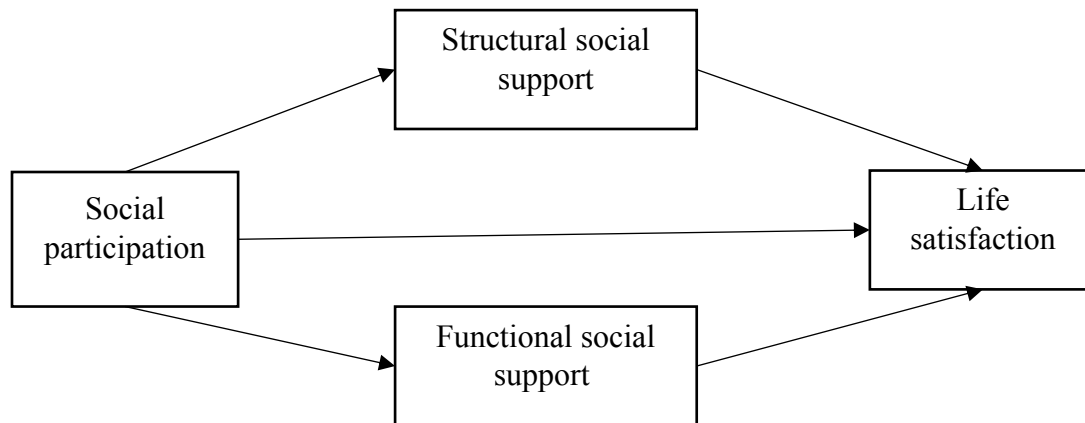
Figure 3-4 Hypothetical model in parallel manner
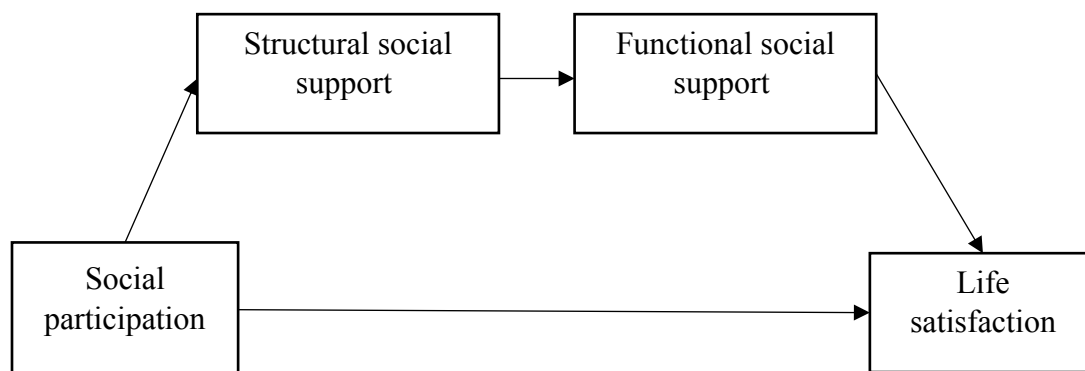
Figure 3-5 Hypothetical model in serial manner with functional social support as proximal factor to life satisfaction
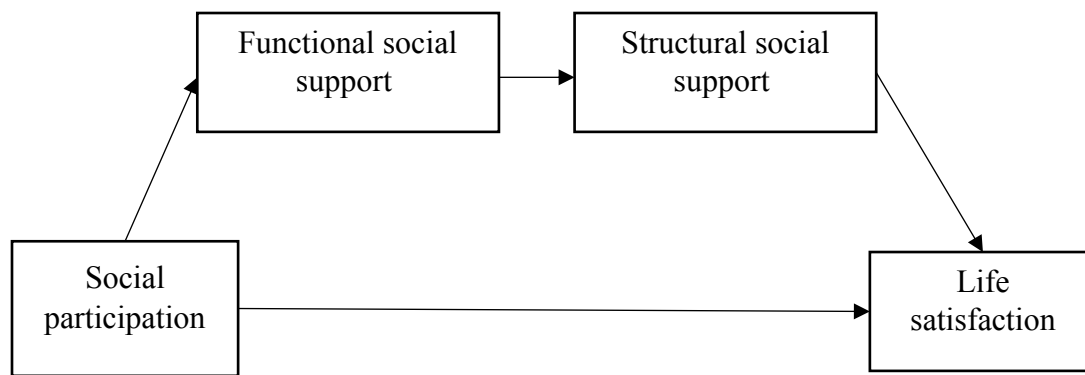
Figure 3-6 Hypothetical model in serial manner with structural social support as proximal factor to life satisfaction

Study 2 was done to achieve research objectives *(2)(a) to examine the presence of the effects of priming negative aging stereotype on episodic memory using an implicit priming task and (2)(b) To investigate whether social participation moderate the effect of (2)(a).* Study 2 utilized an experimental design to capture the objectives. It recruited another group of samples from the community. Under the experimental manipulation, it is hypothesized that (H2.1) the group primed with negative age stereotypes would have a shorter response time to negative emotional words than the control group; (H2.2) the group primed with negative age stereotypes would have a longer response time to positive emotional words than the control group. In order to testify the moderation effect of social participation, it is hypothesized that (H2.3) the effect between experimental manipulation and reaction time to positive emotion words could be moderated by social participation and (H2.4) the effect between experimental manipulation and reaction time to negative emotion words could be moderated by social participation.

During the episodic memory test, it is hypothesized that (H2.5) the group primed with negative age stereotypes would learn significantly fewer words than the control group; (H2.6) the group primed with negative age stereotypes would recall significantly fewer words in 10-minute

delayed recall than the control group; (H2.7) the group primed with negative age stereotypes would recall significantly fewer words in 30-minute delayed recall than the control group; (H2.8) the group primed with negative age stereotypes would recall significantly more intrusion errors in delayed recall than the control group; (H2.9) the group primed with negative age stereotypes would recognize significantly fewer correct trials in recognition trial than the control group; (H2.10) the group primed with negative age stereotypes would report more errors in recognition trial than the control group; (H2.11) the group primed with negative age stereotypes would have lower discrimination score in recognition trial than the control group. As reviewed, socially active individuals could be more inert to negative age stereotypes, hence, should be less impact by negative age stereotype primes in the experiment. Therefore, that participants who are socially active indexed by higher social participation frequency could be less affected by negative age stereotype primes, it is hypothesized (H2.12– H2.14) that the effect of negative age stereotype primes on memory performance in terms of total learning, total recall and discrimination score, could be moderated by social participation.

Interim summary

Looking into the profiles in terms of activity types and its frequency among older adults could provide a clearer understanding of what Hong Kong community-dwelling older adults opt for and how different group of sub-population varies with each other in different domains. Addressing the contribution of the original model shown as Figure 3.1, this chapter also builds a more complex model in incorporating several social indicators to dissect the mechanisms of how social participation contribute to life satisfaction among older adults. It is considered that although social participation is a considerably crucial factor to psychological well-being of older adults, it may not be the most proximal factors within the relationship. Capturing the theoretical

ideas in the original model, social support and social cohesion are argued as more proximal

factors in contributing to life satisfaction among older adults. The relationships of the above

arguments could be comprehended by Study 1a and 1b. Moreover, in the realm of the age

stereotypes, for study 2, it acts as a pioneer study in Hong Kong by revealing the effects of

negative age stereotype primes on memory performance, future studies could be done by

recruiting interventions based on the present findings.

Chapter 4

Study 1

Introduction

To illustrate again, the present dissertation comprised two interrelated studies, the cross-sectional study for Study 1 and the experimental study for study 2. Study 1a is done to achieve objectives *(1)(a) to categorise different types of sub-population based on the general profile of social participation in terms of activities of older adults* and *(1)(b) to examine any similarities or differences based on the identified clusters*. In this chapter, the related details of methodology of Study 1a and 1b were first discussed. Results and discussion were included afterwards.

Study 1

Participants

Study 1 recruited participants under the externally funded project entitled Jockey Club Age-friendly City Project. This project is designed to assess the view of age-friendliness of different districts in Hong Kong, The Hong Kong Polytechnic University has been responsible for four districts. Inclusion criteria included any participants (Hong Kong citizens) who have been living in the targeted district (Sham Shui Po and Yau Tsim Mong) for at least six months. Participants who were not active (self-reported) in their corresponding living area were excluded. Other exclusion criteria included participants with mental illnesses or incapability to finish the questionnaire in the present study. The original study aimed at exploring the age-friendliness of Hong Kong as perceived by individuals aged 18 or older, and my research target variables were embedded within the whole set of questionnaire. For the purpose of this dissertation, I only select adults aged 55 or above for data analysis. The cut-off of 55 was taken based on the idea of young-old suggested by Neugarten (Neugarten, 1974). A total of 719 participants were included in Study 1a and 1b.

Procedures

    With the aid of recruitment by community centres and non-governmental organizations (NGOs), participants were first introduced the background of our study by research helpers, who were trained master students and research assistants in the field of Psychology as well as members from the Institute of Active Aging of the Hong Kong Polytechnic University. After signing the informed consent form, a set of questionnaires would be given. The majority of questionnaires were done by an one-on-one interview approach, participants answered to each question asked by the helper, a standardized format of elaboration sheet of each question is provided to helper when in need.   There were a few aged participants having special difficulties in understanding the questions, research helpers assisted these participants to complete the questionnaire by reading out the questions slowly and asking them to denote their response to each item. The remaining questionnaires were done by self-administered approach. Participants were given a supermarket coupon after completing the questionnaire.

Sampling method

    The present study intended to collect a large sample of questionnaire data as so to investigate the social participation in the form of activity types and mechanisms of social participation to life satisfaction among aged population. Study participants were recruited mainly from community centres and NGOs in Kowloon districts including Sham Shui Po and Yau Tsim Mong by using a convenience sampling approach. Moreover, some of the participants were recruited through snowball sampling, especially for those who have finished the questionnaire first and introduced our project to their relatives, friends or neighbours.

Measures

A number of self-rated measures on capturing social indicators were included in this study. The rationale and details of each instrument are discussed as follow.

Socio-demographic variables

Socio-demographic variables including age, gender, education level, health status, marital status, income, and expenditure were focused in the analyses as factors to be controlled statistically. These variables have been consistent in predicting life satisfaction in previous research (Macia, Duboz, Montepare, & Gueye, 2015). Gender was coded as 1 ('male') or 2 ('female'). Age, indexed as a number, was filled by participants. Education level was measured in eight categories referring to the local education system and further categorized into four groups ranging from 1 ('never') to 4 ('teritary or above'). Health condition was measured by a single item of self-rated health using a 5-point Likert-type scale ranging from 1 ('excellent') to 5 ('bad') and reversed its coding for easier understanding in further analyses. Expenditure was a perceptual item indicating their subjective view of sufficiency of money using a 5-point Likert-type scale ranging from 1 ('very insufficient') to 5 ('very sufficient'). Income was measured by explicit income values by asking participants to indicate their value in the corresponding group, the income value was categorized into 4 options ranging from 1 ('less than $6000') to 4 ('more than 20,000'). These variables were chosen for data analyses as they have been associated with life satisfaction among older adults in previous studies (Au et al., 2017; Fernández-Ballesteros, Zamarrón, & Ruiz, 2001; Macia et al., 2015).

Social Participation

In this dissertation, the definition of social participation suggested by Levasseur's team is adopted with several reasons (Levasseur et al., 2010). First, this definition is raised by the

systematic review by content analysis as discussed above, so it could allow a more general

concept to be revealed given that the academic standard is maintained. Second, they proposed

taxonomy according to the level of involvement with specific examples in order to better capture

which activity falls into the corresponding level. Third, they also distinguish terms like

participation and social engagement from social participation, although there could be some

overlapping elements, the differentiation helps researchers identify the correct constructs.

To recap the idea here, social participation is defined as "a person's involvement in

activities that provide interaction with others in society or the community" (Levasseur et al. 2010,

p. 2148). Based on the content analysis, a taxonomy existing in continuum perspective is

formulated. It consists of six levels of involvement depending on different interactions and

different goals of activities as shown in Figure 4.1. The levels are differentiated based on two

criteria. First, the distance of involvement in activities, it ranges from level 1 representing doing

alone to level 2 for parallel involvement while level 3 to 6 are involvement with interactions.

Second, in terms of the goals of activities, level 1 and 2 are activities regarding basic needs, level
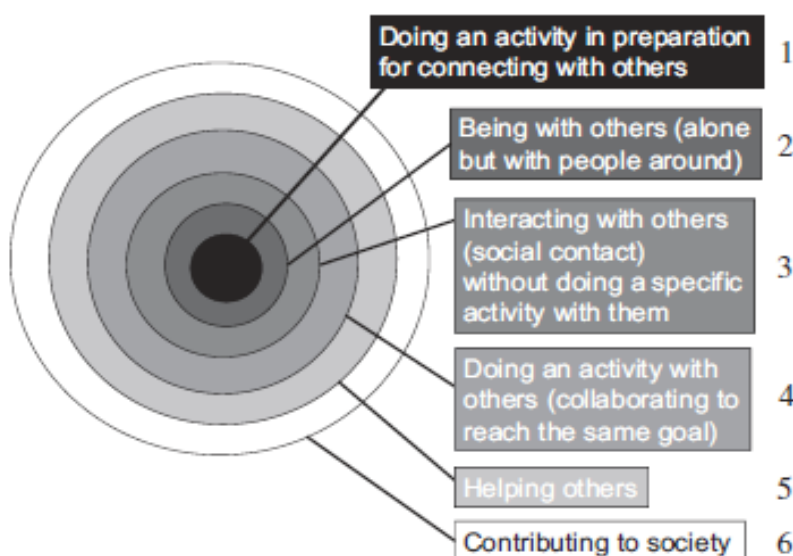
Figure 4-1 The taxonomy of social activities with reference to level of involvements and different goals adopted from Levasseur et al. (2010).

3 and 4 are oriental activities whereas the last two levels are more related to socially- or society-oriented activities. Examples are shown in Table 4-1. Starting from the third level, the activities must involve human or social interactions. Starting from the third level, an individual could simply involve in social contacts like asking a question in the concierge in the shopping mall. In the fourth level, reaching a common goal is the crucial element, for example, playing football with others in order to get a score. In the fifth level, it comprises activities with helping or assisting component like being a caregiver for someone. The last level involves a contribution to the society in a broader sense, for example, participating in a forum for political parties to make greater contribution to the whole aged population. It is defined that it is a way to operationalize and distinguish the concepts of participation, social participation and social engagement (Levasseur et al., 2010). Participation is thought to consist of all levels of involvement. Social participation involves activities from level 3 to 6 while social engagement only requires level 5 and 6. This categorization builds a clearer foundation to discriminate previously confused

Levels	Descriptions	Examples	Activity domain
1	Doing an activity in preparation for connecting with other	Reading newspaper to prepare a chitchat with others	/
2	Being surrounded with others	Taking a bus	/
3	Interacting with others without specific goals	Chatting on phone with friends	Informal social activity
4	Doing an activity with others	Joining a Tai Chi class with others	Leisure activity

| 5 | Helping others | Volunteering in philanthropic organizations | Productive activity |
| 6 | Contributing to a community | Joining a political forum | Formal social activity |

Table 4-1 The examples of using the taxonomy for social activities adopted from Levasseur et al. (2010)

terminologies (Piskur et al., 2014). Based on this definition of social participation, the corresponding activity types for each level were assigned as shown in Table 4-2. They also added that the third and the forth level are somewhat inseparable, activities fell into these two levels are not restricted to role at a particular time or situation, for example, being parents, they can contact with their child through joining a workshop together.

To be more specific, social participation was conceptualized with four level of activity types: informal social activities (2 items), leisure activities (4 items), productive activities (2 items) and formal social activities (2 items). Participants were asked to indicate their frequency on each activity type using 6-point Likert-type scales ranging from 0 ('never') to 5 ('always') with reference to their retrospection of experiences of previous one month. Further prompts were given on the questionnaire, for example, 'always' refers to more than four times a week, this kind of clarification aided interviewers and interviewees to capture the same notions of frequency.

Levels	Activity domain	Items	Ratings
3	Informal social activity	1) Physical meetings with friends or relatives	In terms of frequency: How often do you participate in the following activities?
		2) Contacting others through technological products or apps	
4	Leisure activity	3) Physical activities (E.g. Sports)	
		4) Cultural activities (E.g. Watching Chinese opera)	0: Never
			1: Occasionally (about once/month)
		5) Recreational activities (E.g. joining a party or dinner with friends)	2: Quite often (about once/ bi-weekly)
			3: Often (about once/week)
		6) Religious activities (E.g. attending church)	4: Usually (about 2-4times/ week)
5	Productive activity	7)Caregiving	5: Quite always (more than 4 times/week)
		8)Voluntary work	
6	Formal social activity	9) Social organizational activities	
		10) Political or civic activities (E.g. political forum)	

Table 4-2 Items for measuring social participation

Social Support

Structural social support (SSS) was operationalized as total social network size (SN) in this study, contact frequency could also be considered as structural social support in other studies, however, in this dissertation, I included this item for reference for manipulation check purpose

since items asked in social participation may have included the contact frequency. Referencing the measure of the Social Convoy measure originated by Kahn and Antonucci, a Chinese version of this measure validated in Chinese population has been taken for measures (Cheng, 2009). Participants were asked to indicate the number of people in three social circles: (i) life partner and children, (ii) relatives, and (iii) friends. The total network size was computed. The contact frequency of each circle has also be recorded on a 6-point Likert-type scales ranging from 1 ('never or irregularly') to 6 ('always or living together'). The contact frequency was calculated by averaging among three circles.

Functional social support (FSS) received was measured by asking whether each social circle provided emotional and instrumental support to the participant. Respondents needed to answer each question of each social circle on a 5-point Likert-type scale ranging from 0 ("never") to 4 ("always"). Emotional support was assessed by two items: (i) How often do they make you feel loved and cared for? and (ii) How often do they listen to your worries? Instrumental support was assessed by two items: (i) How often do you count on them to help you with household tasks? and (ii) 'How often do they give you advice or information about medical, financial, or family problems? The scores of each type of support were added, and the total score of each subscale ranged from 0 to 24. The higher scores in emotional support and instrumental support referred to greater functional support received. A score of 0 will be assigned to any social circle with no member, assuming that they would get no social support from that circle. In this study, the total average score of functional support was taken for data analyses which has been used as a common way for determining social support from older adults (Au et al., 2009). The overall reliability in terms of Cronbach's alpha of the functional social support was .83.

Life Satisfaction

The subjective view of life satisfaction was measured by the Satisfaction with Life Scale (SWLS). It is a scale intended to measure the cognitive component of subjective wellbeing (Diener, Emmons, Larsen, & Griffin, 1985). This scale comprises 5 items, participants were asked to rate each item on a 7-point Likert-type scale ranging from 1 ('strongly disagree') to 7 ('strongly agree'). The average score of the scale was taken for analyses, with a higher score indicating better life satisfaction. The reliability in terms of Cronbach's alpha of SWLS was .89.

Data analysis

In Study 1a, the aim was to identify commonalities among older adults in terms of patterns of activity types, k-means clustering analysis was conducted. Cluster analysis is chosen as the statistical tool since its goals is to group individuals with references to their characteristics that they commonly possess (Hair Jr, Black, Babin, & Anderson, 2010). It is different from classical factor analysis in which it undergoes groupings according to patterns of variation or correlation while cluster analysis judges groupings based on distance or proximity. The mathematically produced clusters should be high in internal homogeneity and external heterogeneity. A two-step clustering procedure was planned as it is the most convenient tool to select appropriate number of clusters and its applicability of dealing with large sample size. It involves two steps, hierarchical approach was first conducted to identify cluster seed points, K-means clustering would then be performed for establishing the number of cluster according to the observations of variables and reassigning observations until cluster distinctiveness is achieved (Hair Jr et al., 2010). Cluster distances were estimated by using the log-likelihood criterion so as to form clusters depending on the decrease in the log-likelihood. The decision of appropriate number of cluster membership was made by Bayesian Information Criterion (BIC). After the

formation of clusters, subsequent comparisons using multivariate analysis of variance

(MANOVA)(if more than two clusters resulted) or t-tests (only two clusters were observed)

would be carried out for investigating the similarities and differences of target measures between

clusters. All statistics were done by using SPSS version 25.

As in Study 1b, several hierarchical multiple regression were performed to investigate

which social activity type was particularly associated with life satisfaction, and based on this

judgement, to further explore the mechanisms of how specific social activity type could

contribute to life satisfaction by means of social support. As a rule of thumb, regression analysis

involves several assumptions including independence of observations, the linear relationship

between dependent variable and target independent variables, the checking of homoscedasticity

of residuals and residuals should be normally distributed as well as the checking of data with no

outliers (Field, 2013). For the last assumption, the item asking political activities has been

removed, the remaining items were then inputted for checking of meeting assumptions. For

independence of observations, since the observations are discrete for each member, it is highly

unlikely that observations will be related, the assumption of independence of observations was

met. The linearity and the assumption of homoscedasticity have been checked for all variables

by using partial regression plots between each independent variable against the predicted values

of dependent variable (life satisfaction).   All plots showed a linear relationship between the

independent variable and the dependent variable. There was no evidence of multicollinearity

indexed by all tolerance values larger than .1. Normality of data was also assessed by Q-Q plots,

all basic assumptions were checked before we enter the stage of regression.

In Study 1b, the aim was to testify different models of how social participation

contributes to life satisfaction as shown in Figure 3.4 – Figure 3.6. All statistics were done by

using SPSS version 25. Correlation analysis was first conducted to explore the bi-variate associations between all variables in this study, especially to determine the covariates to be controlled in the subsequent analyses. Then, a series of hierarchical multiple regression would be performed to investigate which social activity type was particularly associated with life satisfaction after controlling socio-demographic variables. Based on the judgement, I could further explore the mechanisms of how specific social activity type could contribute to life satisfaction by means of social support. Since there is no specific command in PROCESS in capturing the theoretical frame suggested in Figure 3.5 – Figure 3.6, the serial mediation analyses using ordinary least squares path analyses were conducted using the SPSS macro PROCESS (model 6), with social network size (SN) and functional social support (FSS) as mediators in the proposed model, these mediators interchanged in the competing models while the parallel mediation analysis was performed in SPSS macro PROCESS (model 4) with a similar approach (Hayes, 2018). To elaborate, although the serial mediation model approach was taken, if any of the associations found to be non-significant in parallel mediation models, it could be neglected in the serial mediation model. Thus, Figure 3.5 – Figure 3.6 only showed the assumed models with all variables were associated. The bias-corrected bootstrapping method was used to examine the indirect effects based on 10,000 bootstrap samples at a 95% confidence level. Indirect effects were considered statistically significant when the confidence intervals did not contain zero (Pieters, 2017). By testing the parallel and serial mediation models, results could inform researchers, as indicated by the hypothetical models, whether which variable was deemed as more proximal indicators of well-being of the aged adults.

Results of Study 1a

Descriptive statistics

There were 719 participants successfully filled the questionnaire. Table 4-1 showed all the demographic statistics of these 719 samples. This sample was composed of 555 women (77.2%) and 164 men (22.8%). The average age of this population was 72.56 ($SD = 8.39$) ranging from 55 to 95 years old. As using convenience sampling from NGOs, the sample was from two districts, namely, Sham Shui Po (n = 379, 52.7%) and Yau Tsim Mong (n = 340, 47.3%). The majority of the samples were married (46.3%) while 40% of them were widowed. The remaining 14% were single, divorced or separated. Among working status, only 9 individuals (1.3%) reported that they were jobless while 31 of them (4.3%) were working, almost all participants were either retired or stated as a housewife (94.4%).

Concerning their education level, I manually computed the levels of education attainment of older adults in both Sham Shui Po and Yau Tsim Mong districts as shown in Figure 7.1. Comparatively, our collected samples were more centralized with secondary but fewer participants with either no education background or tertiary education attainment (36.7% of samples versus 30.6% in Census data for secondary education attainment; 16.1% of samples versus 21.1% in Census data for no education attainment; 7.4% of samples versus 10.1% in Census data for tertiary education attainment). Yet, the general distribution is more or less similar.

Since the majority of the samples were either retired or responsible for role of housewife, it is obvious that their income per month would not be high. Comparatively, 456 participants (63.4%) reported that had fewer than $6000 per month while only 51 participants (7.1%) rated that they had more than $15000 per month as income. Nevertheless, there was an abundant

amount (62.4%) of participants reporting that they had just enough to spend, while about 20% of them reported they had not sufficient money to spend and around 14% of them reported they had sufficient money to spend.

Regarding self-rated health, nearly half of them (50.8%) rated themselves as average health status, followed by a quarter of them rated as good health. Around 11% of them rated either as very good health status or bad health status, only 10 participants (1.4%) considered they were excellent in health status.
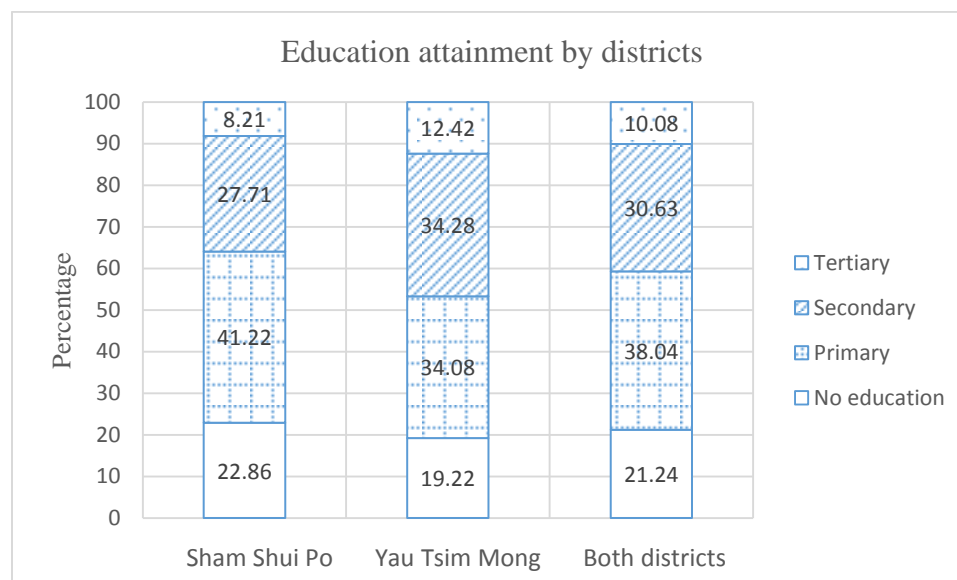
Figure 4-2 Education attainment by districts

Manipulations of social participation

There has been one critique on using k-means clustering concerning its over-sensitivity to extreme data and outliers (Gan & Ng, 2017). Before conducting the cluster analysis, as a rule-of-thumb in determining the normality of items in activity types, the skewness and kurtosis of each item were first checked. Results indicated that nearly all items were within range of |2| in the skewness and the range of |3| in kurtosis except the item of 'Political or civic activities'

(skewness = 2.46, kurtosis = 5.99). The positively skewed nature revealed that older people

tended not to participate in political activity, this has been shown in some previous studies (Kam,

2000; Wong et al., 2015). More specifically, 74% of the samples indicated that they did not join

any political activities. Since this item is skewed, it was excluded in later analysis although it

could be intriguing that there could be a group of older adults who are relatively more politically

active, this situation might not be reflected in our samples in the this study. There were 9 items

of social participation types remained in the analysis. Descriptive details of frequency of 9 items

were presented in Table 4-2. As indicated, there were about 45% of participants rating they have

never joined these two activities, namely, religious activities and care-giving. One third of

participants reported that they did not carry out any voluntary work. Among all activities, the

highest percentage of always participation lied in only physical activities.

Variables	Total (n = 719)		Sham Shui Po (n = 379)		Yau Tsim Mong (n = 340)	
	Frequency/ Mean	Percentage (%)/ Standard deviation	Frequency/ Mean	Percentage (%)/ Standard deviation	Frequency/ Mean	Percentage (%)/ Standard deviation
Age	72.56	8.39	72.31	8.45	72.84	8.32
Gender						
Female	555	77.2	301	20.6	254	74.7
Male	164	22.8	78	79.4	86	25.3
Marital status						
Single	49	6.8	23	6.1	26	45.3
Married	333	46.3	179	47.2	154	7.6
Widowed	285	39.6	148	39.1	137	40.3
Others	52	7.2	29	7.7	23	6.8
Job status						
Jobless	9	1.3	2	0.5	7	2.1
Retired /Housewife	679	94.4	352	92.9	327	96.2
Employed	31	4.3	25	6.6	6	1.8
Education level						
Never	116	16.1	57	15.0	59	17.4
Primary	286	39.8	148	39.1	138	40.6
Secondary	264	36.7	151	39.8	113	33.2
Tertiary	53	7.4	23	6.1	30	8.8
Income per month						
< $6000	456	63.4	228	60.2	228	67.1
$6000-$14999	212	29.5	119	31.4	93	27.4
> $14999	51	7.1	32	8.4	19	5.6
Expenditure						
Very insufficient	13	1.8	8	2.1	5	1.5
Insufficient	145	20.2	80	21.1	65	19.1
Just enough	449	62.4	226	59.6	223	65.6
Sufficient	98	13.6	55	14.5	43	12.6
Very sufficient	14	1.9	10	2.6	4	1.2
Health						
Excellent	10	1.4	2	0.5	8	2.4
Very good	80	11.1	45	11.9	35	10.3
Good	180	25.0	96	25.3	84	24.7

Average	365	50.8	192	50.7	173	50.9
Bad	84	11.7	44	11.6	40	11.8

Table 4-3 Descriptive statistics of demographic variables

Activity types	Frequency (%)					
	Never	Seldom	Sometim	Often	Usually	Always
Physical meetings	2.2	13.4	12.4	22.3	31.7	18.1
Contacting others through technology	6.5	9.2	8.1	21.3	35.2	19.7
Physical activities	8.2	11.1	6.8	14.9	21.7	37.3
Cultural activities	21.2	25.7	15.4	23.6	12.1	1.9
Recreational activities	8.6	16.8	16.8	26.7	23.6	7.4
Religious activities	45.6	17.9	7.9	16.8	10.4	1.3
Caregiving	44.5	11.1	6.7	9.0	13.5	15.2
Voluntary work	32.4	16.0	9.6	18.2	18.2	5.6
Social organizational activities	14.7	13.6	15.3	17.4	21.1	15.9

Note. The composite percentage may not be 100% due to rounding off issue

Table 4-4 Descriptive analysis of nine social activity types (n = 719)

To further reveal the internal consistency among these 9 items, internal consistency reliability test was performed. Results revealed that the internal consistency reliability of 9 items was $\alpha = .60$. This may indicate that these 9 items were not probing the same construct which was conceptualized as social participation. The inter-item correlations were computed and were shown in Table 4-5. As noted, each item among activities was weakly associated, the mean inter-item correlation was $r = .15$. Furthermore, the item of religious activities and the item of

cultural activities were found to be un-correlated with five activities and three activities respectively. These analyses warranted justification on the original conceptualization on these ten activity types with regard to the construct of social participation. Therefore, these items were no longer considered a full scale but a single item separately for further analyses.

Activity types	Contacting others through technology	Physical activities	Cultural activities	Recreational activities	Religious activities	Caregiving	Voluntary work	Social organizational activities
Physical meetings	.34**	.26**	.04	.24**	-.02	.09*	.16**	.09*
Contacting others through technology		.16**	.16**	.16**	.05	.16**	.18**	.13**
Physical activities			.13**	.14**	-.01	.01	.12**	.21**
Cultural activities				.30**	.15**	.15**	.26**	.21**
Recreational activities					.08*	.11**	.23**	.21**
Religious activities						.04	.15**	.04
Caregiving							.16**	.09*
Voluntary work								.29**

Note. *p <.05, ** p <.01 (2-tailed)

Table 4-5 Correlations between nine social activity types (n = 719)

Results of cluster analysis

As discussed in last chapter, a two-step approach of clustering was performed. The nine activities of social participation were selected as the clustering variables, since the measurement of these items was consistent, standardization of items was not performed and multicollinearity effect was considered, as reflected in Table 4-5, all items were not strongly correlated ($r < .50$) (Ketchen & Shook, 1996).

In general, the best solution of number of clusters formed should be attributed to the larger ratio of distance measure. By taking a two-step clustering approach, BIC continued to decline from a single cluster to six clusters solution, however, through examining the ratio of BIC changes and ratio of distance measures, clustering from three to six levels did not show better solution in additional complexity, both variables reached its maximums with two cluster solution. Hence, a two-cluster model was created (BIC = 4318, Ratio of BIC change = 1, Ratio of distance measure = 1.64).

Table 4-6 showed the distribution of the nine social activity types for individuals between clusters. Generally, cluster 2 is characterized by rating higher frequency in participation in all activity types compared to cluster 1, therefore, cluster 2 was named as socially-active participants while cluster 1 was labelled as socially-less-active individuals. A random half of the sample (n = 364) was drawn to re-run the same cluster analysis in order to check the internal stability of the original cluster solution. A two-cluster model was also formed (BIC = 2225, Ratio of BIC change = 1, Ratio of distance measure = 2.60), where 191 participants were assigned into social-active group while 173 participants were allocated into socially-less-active group. Compared with the original model, less than 10% of observations being assigned to a different cluster, the two-cluster model is considered as a stable solution (Hair Jr et al., 2010).

	N	1	2	3	4	5	6	7	8	9
Cluster 1 (socially-less-active)	399	2.95	2.93	3.17	1.28	2.03	1.01	1.51	.90	1.93
Cluster 2 (socially-active)	320	3.56	3.73	3.74	2.58	3.53	1.71	2.20	3.16	3.62
Independent sample t-tests		$6.33^{\#}$	$7.87^{\#}$	$4.74^{\#}$	$13.85^{\#}$	$14.46^{\#}$	$6.21^{\#}$	$4.76^{\#}$	$23.68^{\#}$	$16.11^{\#}$
Degree of freedom		710	709	715	717	713	635	717	717	707

Note. 1 = Physical meetings, 2 = Contacting others through technology, 3 = Physical activities, 4 = Cultural activities, 5 = Recreational activities, 6 = Religious activities, 7 = caregiving, 8 = Voluntary work, 9 = Social organizational activities
$^{\#}$ indicate $p < .001$

Table 4-6 Distribution of social participation frequency between clusters

The mean scores of frequency among nine activity types of the socially-active group were 3.56, 3.73, 3.74, 2.58, 3.53, 1.71, 2.20, 3.16, 3.16 respectively while that of the socially-less-active group were 2.95, 2.93, 3.17, 1.28, 2.03, 1.01, 1.51, 0.90, 1.93 respectively. Both groups rated the highest in physical activities, the socially-less-active group rated lowest in voluntary work while socially-active group rated lowest in religious activities. A series of independent t-tests has been done on investigating the mean difference in terms of frequency in these nine activity items. They differed with each other significantly among all nine items with all ps < .001.

Effects of socio-factors on social activeness

In order to look for similarities and differences among the formed clusters, cross-tabulation with chi-squares tests were performed with relevant socio-demographic variables. As shown in Table 4-7, gender, marital status, job status and income amount were found to be non-

significant across two clusters. Concerning educational attainment, socially-active group

consisted of more educated individuals, considerably, 45% of them was having secondary level

of education while only 9.4% of them reported with no education experience. Table 4-8 showed

the results of independent samples t-tests on continuous variables in socio-demographic

characteristics.

Table 4-8 showed the results of independent samples t-tests of continuous variables

between two clusters. There was no significant difference in age and expenditure between

groups, both groups were aged with a mean of about 72 and perceived that they have marginally

enough money to spend. However, socially-active cluster rated significantly better in health

status than those in socially-less-active cluster $[t\ (638) = 6.53, p < .001]$.

Effects of social factors and life satisfaction by social activeness

Next, the differences among social indicators as well as life satisfaction by two clusters

were included. As predicted, socially-active group possessed significantly higher values than

socially-less-active group among all indicators. Specifically, as shown in Table 4-9, socially-

active group had significant larger network size $[t\ (717) = 2.86, p = .004]$, better functional social

support $[t\ (717) = 5.08, p < .001]$ and better life satisfaction $[t\ (717) = 3.28, p = .001]$ than the

counterparts.

	Groups			
	Socially-less-active (N = 399)		Socially-active (N = 320)	
Variables	N	%	N	%
Gender	(χ^2 = 1.16, df = 1 , p = .282)			
Female	314	78.7	241	75.3
Male	85	21.3	79	24.7
Marital status	(χ^2 = 1.90, df = 3 , p = .593)			
Single	176	44.1	157	49.1
Married	29	7.3	20	6.3
Widowed	163	40.9	122	38.1
Others	31	7.8	21	6.6
Job status	(Fisher's exact test, p = .071)			
Jobless or employed	28	7.0	12	3.8
Retired/Housewife	371	93.0	308	96.3
Education level***	(χ^2 = 27.81, df = 3 , p < .001)			
Never	86	21.6	30	9.4
Primary	165	41.4	121	37.8
Secondary	120	30.1	144	45.0
Tertiary	28	7.0	25	7.8
Income per month	(χ^2 = .93, df = 2 , p = .627)			
< $6000	255	63.9	201	62.8
$6000-$14999	119	29.8	93	29.1
> $15000	25	6.3	26	8.1

Note. The composite percentage may not be 100% due to rounding off issue
* p < .05,** p < .01, *** p < .001

Table 4-7 Cross tabulation between social activity type clusters and socio-demographic characteristics

	Groups			
	Socially-less-active (N = 399)		Socially-active (N = 320)	
Variables				
	Mean	*SD*	*Mean*	*SD*
Age	72.99	8.64	72.02	8.04
Expenditure	2.90	.71	2.98	.68
Self-rated health***	2.21	.80	2.63	.92
Total network size **	16.76	10.98	19.09	10.66
Average contact frequency***	3.38	1.10	3.71	1.07
Functional social support***	1.43	.69	1.69	.66
Life satisfaction**	4.59	.91	4.81	.88

Note. $* p < .05,** p < .01, *** p < .001$

Table 4-8 Independent samples t-tests between social activity type clusters and socio-demographic characteristics, social indicators and life satisfaction among two clusters

Results of Study 1b

Correlations between life satisfaction and socio-variables

Table 4-10 showed the correlations between socio-demographic variables and life satisfaction. Life satisfaction was positively correlated with age, retirement status, expenditure and self-rated health.

Correlations between life satisfaction and social activity types

Table 4-11 showed the correlations between nine social activity types and life satisfaction. Results indicated that there were three activity types that were not associated with life satisfaction among older adults, namely, religious activities, care-giving and social organizational activities. The remaining six activity types were included in the subsequent analyses for investigating the mediation between each activity type and life satisfaction.

Correlations between life satisfaction and other social determinants

Table 4-12 showed the correlations between life satisfaction and other social determinants of the present study. Life satisfaction was only correlated with total network size, functional social support. To further reveal the potential mediation factor between social activity and life satisfaction, all social determinants were included for the subsequent analyses in regression and mediation models.

	Gender	Job status^	Marital status#	Income	Education	Expenditure	Self-rated health	Life satisfaction
Age	-.09*	.30**	-.24**	-.32**	-.36**	.01	-.06	.16**
Gender		.01	-.27**	-.05	-.20**	.06	-.09*	-.01
Job status			-.08*	-.22**	-.17**	.00	-.04	.12**
Marital status				.26**	.22**	-.01	.09*	.01
Income					.30**	.33**	.17**	.06
Education						.07	.11**	-.09*
Expenditure							.12**	.30**
Self-rated health								.31**

Note. *p <.05, ** p <.01 (2-tailed)
^Job status (0 = jobless/unemployed, 1 = retired/ housewife)
#Marital status (0 = others, 1 = married)

Table 4-9 Correlations between socio-demographic variables and life satisfaction (n = 719)

Activity types	Physical meetings	Contacting others through technology	Physical activities	Cultural activities	Recreational activities	Religious activities	Caregiving	Voluntary work	Social organizational activities
Life satisfaction	.11**	.10**	.20**	.12**	.18**	.01	.01	.14**	.07

Note. *p <.05, ** p <.01 (2-tailed)

Table 4-10 Correlations between activity types and life satisfaction (n = 719)

	Average contact frequency	Functional social support	Life satisfaction
Total network size	.27**	.26**	.07*
Average contact frequency		.47**	.19*
Functional social support			.23**

*Note. *p <.05, ** p <.01 (2-tailed)*

Table 4-11 Correlations between social determinants and life satisfaction (n = 719)

Results of hierarchical multiple regression

In regression analysis, predictor variables have to be either interval or ratio in nature. Hence, before running the hierarchical multiple regression, categorical variables were dummy coded in the subsequent analyses. These variables included (i) gender (0 = male, 1 = female), (ii) job status (0 = jobless or employed, 1 = housewife or retired), (iii) three dummy variables on marital status (0 = others, 1 = married; 0 = others, 1 = single; 0 = others, 1 = widowed), three dummy variables on education attainment (0 = no education, 1 = primary; 0 = no education, 1 = secondary; 0 = no education, 1 = tertiary), two dummy variables on income group (0 = <$6000, 1 = $6000-$14999; 0 = <$6000, 1 = >$14999).

A series of hierarchical multiple regression was run to determine if addition of each activity type could improve life satisfaction after controlling socio-demographic variables. Among all model 1 shown in Table 4.13 – 4.18, socio-demographic variables were statistically significantly associated with life satisfaction, R^2 = .23, F (13, 705) = 16.30, p < .001, adjusted R^2 = .22. The addition of each activity type to the association of life satisfaction was found significant only in (i) contacting others, R^2 change = .01, F (1, 704) = 4.45, p = .040; (ii) physical activities, R^2 change = .01, F (1, 704) = 11.30, p = .001; (iii) cultural activities, R^2 change = .01, F (1, 704) = 7.06, p = .010; (iv) recreational activities, R^2 change = .01, F (1, 704) = 11.69, p = .001; (v) voluntary work, R^2 change = .01, F (1, 704) = 8.07, p = .010. Physical meeting was no longer associated with life satisfaction when socio-demographic variables were included. Given that only these five activity types were associated with life satisfaction, the subsequent model testing analyses would only involve these five variables.

| | Life satisfaction | | | |
| | Model 1 | | Model 2 | |
Variable	B	ß	B	ß
Constant	2.42***		2.32***	
Age	.01	.06	.01	.06
Gender	-.08	-.04	-.09	-.04
Job	-.39**	-.09	-.38**	-.09
Marital[#]				
Married	.37**	.21	.36**	.20
Single	.03	.01	.04	.01
Widowed	.44**	.24	.42**	.23
Education[^]				
Primary	-.10	-.06	-.09	-.05
Secondary	-.26**	-.14	-.25**	-.13
Tertiary	-.13	-.04	-.12	-.03
Income group[&]				
$6000-$14999	-.04	-.02	-.05	-.03
>$15000	-.08	.02	-.08	-.02
Expenditure	.35***	.27	.34***	.27
Self-rated health	.30***	.29	.29***	.29
Physical meeting			.03	.05
R^2	.23		.23	
F	16.30***		15.23***	
ΔR^2			<.01	
ΔF			.13	

Note. $N = 719$.

[#] Marital status: Others as reference group

[^] Education: No education as reference group

[&] Income: <$6000 as reference group

B = Beta coefficients, ß = standardized Beta coefficients

* $p < .05$, ** $p < .01$, *** $p < .001$

Table 4-12 Hierarchical multiple regression associating life satisfaction from socio-demographic characteristics and physical meeting

	Life satisfaction			
	Model 1		Model 2	
Variable	B	ß	B	ß
Constant	2.42***		2.23***	
Age	.01	.06	.01	.07
Gender	-.08	-.04	-.09	-.04
Job	-.39**	-.09	-.38**	-.09
Marital[#]				
Married	.37**	.21	.36**	.20
Single	.03	.01	.04	.01
Widowed	.44**	.24	.41**	.22
Education[^]				
Primary	-.10	-.06	-.11	-.06
Secondary	-.26**	-.14	-.27**	-.15
Tertiary	-.13	-.04	-.15	-.04
Income group[&]				
$6000-$14999	-.04	-.02	-.05	.03
>$15000	-.08	.02	-.07	.02
Expenditure	.35***	.27	.34***	.26
Self-rated health	.30***	.29	.29***	.29
Contacting others through technology			.05*	.07
R^2	.23		.24	
F	16.30***		15.53***	
ΔR^2			.01	
ΔF			4.45*	

Note. $N = 719$.

[#] Marital status: Others as reference group

[^] Education: No education as reference group

[&] Income: <$6000 as reference group

B = Beta coefficients, ß = standardized Beta coefficients

* $p < .05$,** $p < .01$, *** $p < .001$

Table 4-13 Hierarchical multiple regression associating life satisfaction from socio-demographic characteristics and contacting others through technology

	Life satisfaction			
	Model 1		Model 2	
Variable	B	ß	B	ß
Constant	2.42***		2.25***	
Age	.01	.06	.01	.06
Gender	-.08	-.04	-.08	-.04
Job	-.39**	-.09	-.36	-.09
Marital[#]				
Married	.37**	.21	.36**	.20
Single	.03	.01	.02	.01
Widowed	.44**	.24	.40**	.22
Education[^]				
Primary	-.10	-.06	-.08	-.04
Secondary	-.26**	-.14	-.23**	-.12
Tertiary	-.13	-.04	-.11	-.03
Income group[&]				
$6000-$14999	-.04	-.02	-.04	-.02
>$15000	-.08	.02	.-06	-.02
Expenditure	.35***	.27	.34***	.26
Self-rated health	.30***	.29	.28***	.27
Physical activities			.06**	.11
R^2	.23		.24	
F	16.30***		16.17***	
ΔR^2			.01	
ΔF			11.30**	

Note. N = 719.

[#] Marital status: Others as reference group

[^] Education: No education as reference group

[&] Income: <$6000 as reference group

B = Beta coefficients, ß = standardized Beta coefficients

* $p < .05$,** $p < .01$, *** $p < .001$

Table 4-14 Hierarchical multiple regression associating life satisfaction from socio-demographic characteristics and physical activities

| | Life satisfaction | | | |
| | Model 1 | | Model 2 | |
Variable	B	ß	B	ß
Constant	2.42***		2.33***	
Age	.01	.06	.01	.06
Gender	-.08	-.04	-.07	-.03
Job	-.39**	-.09	-.39**	-.09
Marital[#]				
Married	.37**	.21	.36**	.20
Single	.03	.01	.03	.01
Widowed	.44**	.24	.42**	.23
Education[^]				
Primary	-.10	-.06	-.13	-.07
Secondary	-.26**	-.14	-.30**	-.16
Tertiary	-.13	-.04	-.17	-.05
Income group[&]				
$6000-$14999	-.04	-.02	-.03	-.02
>$15000	-.08	.02	-.09	-.03
Expenditure	.35***	.27	.35***	.27
Self-rated health	.30***	.29	.28***	.27
Cultural activities			.06*	.09
R^2	.23		.24	
F	16.30***		15.77***	
ΔR^2			.01	
ΔF			7.06*	

Note. $N = 719$.

[#] Marital status: Others as reference group

[^] Education: No education as reference group

[&] Income: <$6000 as reference group

B = Beta coefficients, ß = standardized Beta coefficients

* $p < .05$, ** $p < .01$, *** $p < .001$

Table 4-15 Hierarchical multiple regression associating life satisfaction from socio-demographic characteristics and cultural activities

	Life satisfaction			
	Model 1		Model 2	
Variable	B	ß	B	ß
Constant	2.42***		2.30***	
Age	.01	.06	.01	.06
Gender	-.08	-.04	-.09	-.04
Job	-.39**	-.09	-.37**	-.09
Marital[#]				
Married	.37**	.21	.34**	.19
Single	.03	.01	.02	<.01
Widowed	.44**	.24	.40**	.21
Education[^]				
Primary	-.10	-.06	-.11	-.06
Secondary	-.26**	-.14	-.26**	-.14
Tertiary	-.13	-.04	-.13	-.04
Income group[&]				
$6000-$14999	-.04	-.02	-.05	-.03
>$15000	-.08	.02	-.11	-.03
Expenditure	.35***	.27	.35***	.27
Self-rated health	.30***	.29	.28***	.27
Recreational activities			.07**	.12
R^2	.23		.24	
F	16.30***		16.20***	
ΔR^2			.01	
ΔF			11.69**	

Note. $N = 719$.

[#] Marital status: Others as reference group

[^] Education: No education as reference group

[&] Income: <$6000 as reference group

B = Beta coefficients, ß = standardized Beta coefficients

* $p < .05$, ** $p < .01$, *** $p < .001$

Table 4-16 Hierarchical multiple regression associating life satisfaction from socio-demographic characteristics and recreational activities

	Life satisfaction			
	Model 1		Model 2	
Variable	B	ß	B	ß
Constant	2.42***		2.37***	
Age	.01	.06	.01	.06
Gender	-.08	-.04	-.08	-.04
Job	-.39**	-.09	-.37*	-.09
Marital[#]				
Married	.37**	.21	.37**	.20
Single	.03	.01	.06	.02
Widowed	.44**	.24	.42**	.23
Education[^]				
Primary	-.10	-.06	-.14	-.08
Secondary	-.26**	-.14	-.31**	-.17
Tertiary	-.13	-.04	-.16	-.05
Income group[&]				
$6000-$14999	-.04	-.02	-.03	-.01
>$15000	-.08	.02	-.07	-.02
Expenditure	.35***	.27	.35***	.27
Self-rated health	.30***	.29	.28***	.27
Voluntary work			.05**	.10
R^2	.23		.24	
F	16.30***		15.87***	
ΔR^2			.01	
ΔF			8.07*	

Note. $N = 719$.

[#] Marital status: Others as reference group

[^] Education: No education as reference group

[&] Income: <$6000 as reference group

B = Beta coefficients, ß = standardized Beta coefficients

* $p < .05$,** $p < .01$, *** $p < .001$

Table 4-17 Hierarchical multiple regression associating life satisfaction from socio-demographic characteristics and voluntary work

Results of mediation analyses – parallel models

As discussed, only five items of social participation were significantly associated with life satisfaction after controlling the socio-demographic variables. Parallel mediation model assumes that these two types of social support mediate the relationship between social participation and life satisfaction correspondingly. Five parallel mediation analyses were conducted to reveal the relationships by controlling the socio-demographic variables.

For activity of 'contacting others through technology', Figure 4.2 indicated that it was associated with total network size (B = 1.512, $p < .001$, 95% CI = .958 – 2.066) and functional social support (B = .139, $p < .001$, 95% CI = .106 – .172). However, only functional social support was associated with life satisfaction (B = .231, $p < .001$, 95% CI = .136 – .326). Moreover, the direct effect of contacting others through technology was found to be non-significant, hence, it was alluded that functional social support significantly mediated the relationship between contacting other through technology and life satisfaction (a_2b_2 = .032, 95% CI = .018 – .048).

For activity of 'physical activities', Figure 4.3 showed that it was associated with total network size (B = .847, p = .001, 95% CI = .369 – 1.325) and functional social support (B = .046, p = .002, 95% CI = .017 – .075). However, only functional social support was associated with life satisfaction (B = .229, $p < .001$, 95% CI = .137 – .320). The direct effect of physical activities was found to be significant (c' = .061, p = .001, 95% CI = .025 – .097). Hence, it was found that functional social support significantly partially mediated the relationship between physical activities and life satisfaction (a_2b_2 = .011, 95% CI = .003 – .019).

Regarding 'cultural activities', Figure 4.4 revealed the results of the parallel mediation analysis between cultural activities and life satisfaction, cultural activities was only

correlated with functional social support (B = .076, $p < .001$, 95% CI = .041 − .112), which was associated with life satisfaction (B = .229, $p < .001$, 95% CI = .136 − .322). From the analysis, it was found that functional social support fully mediated the relationship between cultural activities and life satisfaction (a_2b_2 = .017, 95% CI = .008 − .030).

Figure 4.5 revealed the results of the parallel mediation analysis between recreational activities and life satisfaction. 'Recreational activities' was associated with both social network size (B = .938, $p = .001$, 95% CI = .375 − 1.502) and functional social support (B = .072, $p < .001$, 95% CI = .037 − .106), yet, only functional social support was further associated with life satisfaction (B = .224, $p < .001$, 95% CI = .132 − .317). Moreover, the item of recreational activities was significantly associated with life satisfaction (B = .065, p = .003, 95% CI = .023 − .107). Hence, functional social support was partially mediated the relationship (a_2b_2 = .016, 95% CI = .007 − .027.

Figure 4.6 revealed the results of the parallel mediation analysis between voluntary work and life satisfaction. Voluntary work was positively associated with social network size (B = .594, $p = .015$, 95% CI = .118 − 1.069) as well as functional social support (B = .038, p = .009, 95% CI = .009 − .067). Similarly, only functional social support was correlated with life satisfaction (B = .234, $p < .001$, 95% CI = .143 − .326), and it was partially mediated the relationship between voluntary work and life satisfaction (a_2b_2 = .009, 95% CI = .002 − .018) since the direct effect was significant (B = .041, $p = .025$, 95% CI = .005 − .076).
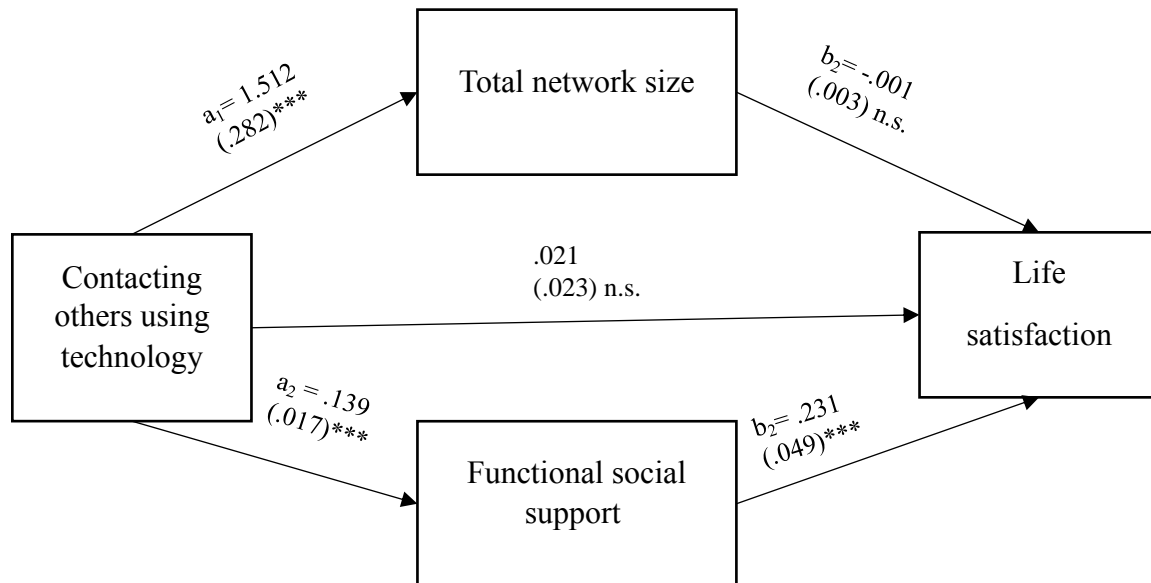
Figure 4-3 Parallel mediation model between contacting others through technology and life satisfaction

Note. Numeric values represent regression coefficients and numbers in parentheses represent standard errors. *$p < .05$, ** $p < .01$, *** $p < .001$.
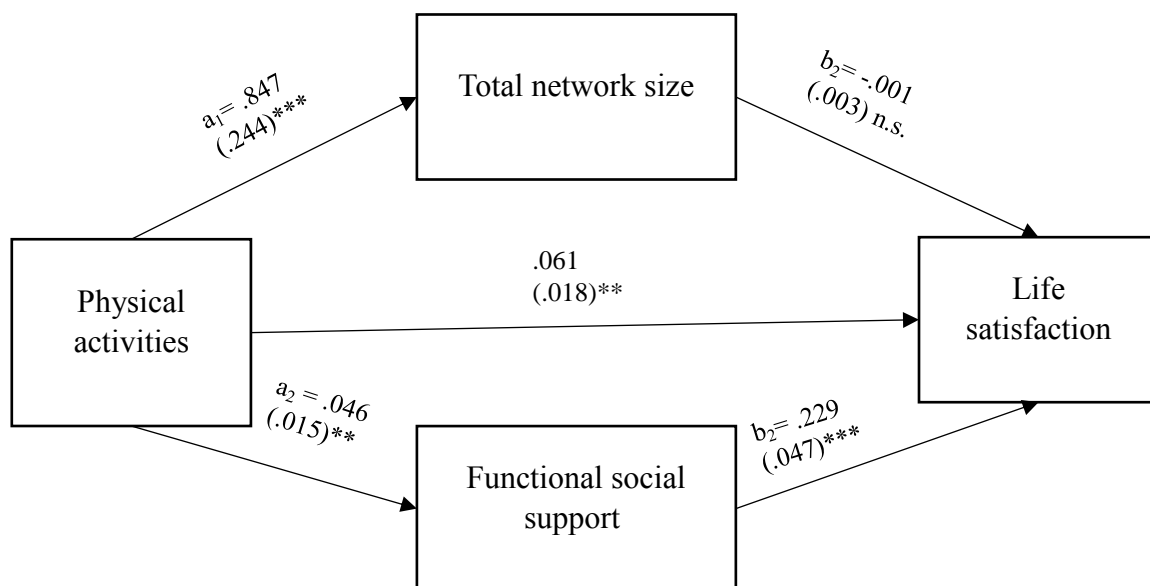
Figure 4-4 Parallel mediation model between physical activities and life satisfaction

Note. Numeric values represent regression coefficients and numbers in parentheses represent standard errors. *$p < .05$, ** $p < .01$, *** $p < .001$.
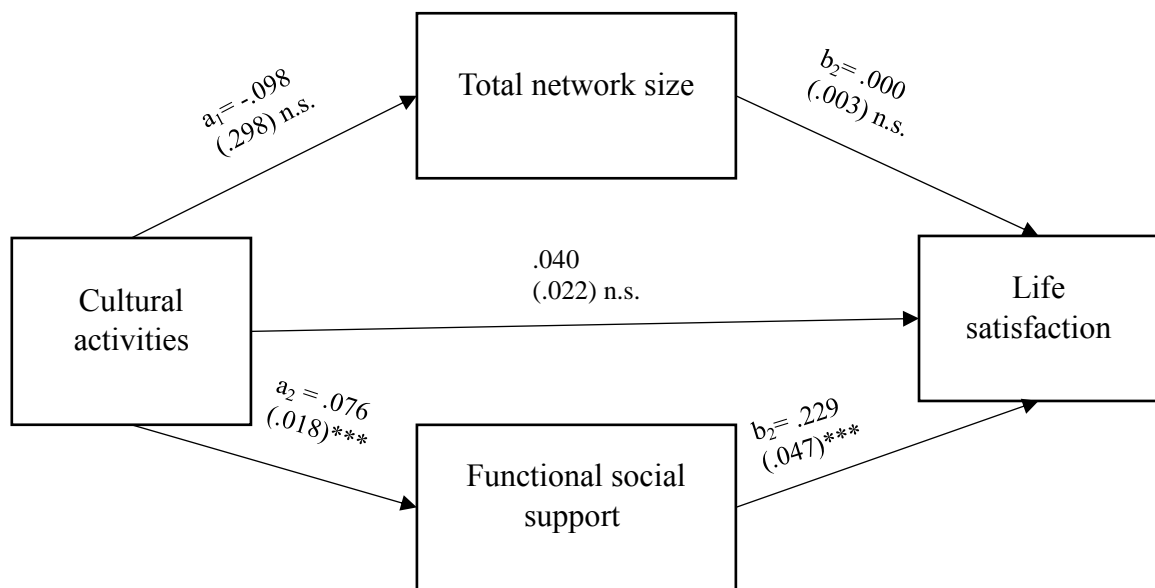
Figure 4-5 Parallel mediation model between cultural activities and life satisfaction

Note. Numeric values represent regression coefficients and numbers in parentheses represent standard errors. *$p < .05$, ** $p < .01$, *** $p < .001$.
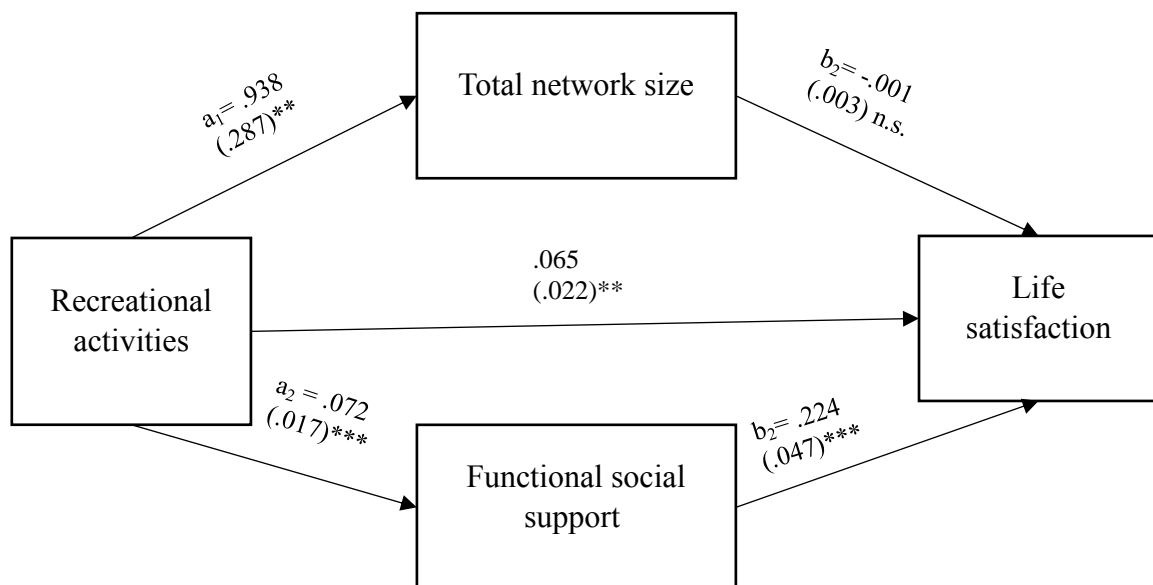
Figure 4-6 Parallel mediation model between recreational activities and life satisfaction

Note. Numeric values represent regression coefficients and numbers in parentheses represent standard errors. *$p < .05$, ** $p < .01$, *** $p < .001$.
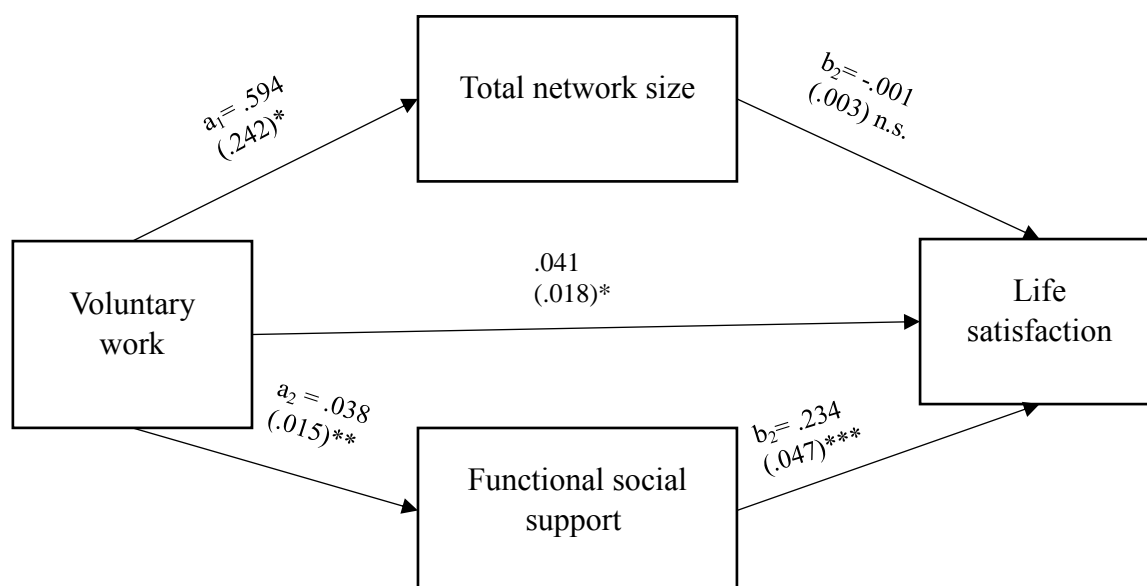
Figure 4-7 Parallel mediation model between recreational activities and life satisfaction

Note. Numeric values represent regression coefficients and numbers in parentheses represent standard errors. *$p < .05$, ** $p < .01$, *** $p < .001$.

Results of mediation analyses – serial models

From the above parallel models, it was observed that only social network size and functional social support were significantly positively associated with only four activity types (i.e. Contacting others using technology, physical activities, recreational activities and voluntary work), therefore, the following analyses will only consider the serial model suggested in Figure 3.5, that is the functional social support to be the more proximal factor contributed to life satisfaction.

Figure 4.8 showed the serial relationship of 'contacting others through technology' and life satisfaction by serially putting social network size and functional social support as two mediators. It showed that 'contacting others through technology' was associated with social network size (B = 1.512, $p < .001$, 95% CI = .958 − 2.066), that further correlated with functional social support (B = .010, $p < .001$, 95% CI = .006 − .014) and functional social support further associated with life satisfaction (B = .231, $p < .001$, 95% CI = .136 − .326).

This activity was also associated with functional social support (B = .124, p < .001, 95% CI = .091 – .157). The direct effect of 'contacting others through technology' to life satisfaction was found to be non-significant (c' = .021, p = .360). Hence, it was found that the relationship between 'contacting others through technology' and life satisfaction was serially fully mediated by social network size and functional social support ($a_1 d_{21} b_2$ = .003, 95% CI = .001 – .007). The indirect path of 'contacting others through technology' through functional social support to life satisfaction was also significant ($a_2 b_2$ = .029, 95% CI = .015 – .044).

Comparatively, Figure 4.9 showed the serial relationship of physical activities and life satisfaction by incorporating social network size and functional social support as two mediators. Results showed that 'physical activities' was associated with social network size (B = .847, p = .001, 95% CI = .369 – 1.325), which in turn associated with functional social support (B = .012, p < .001, 95% CI = .008 – .017) and further associated with life satisfaction (B = .229, p < .001, 95% CI = .137 – .320). The direct effect of 'physical activities' to life satisfaction was significant (c' = .061, p = .001). Hence, the relationship between 'physical activities' and life satisfaction was serially partially mediated by social network size and functional social support ($a_1 d_{21} b_2$ = .002, 95% CI = .001 – .005). Another significant indirect path was found in functional social support, it partially mediated the relationship between 'physical activities' and life satisfaction ($a_2 b_2$ = .008, 95% CI = .001 – .016).

Figure 4.10 showed the serial relationship of 'recreational activities' and life satisfaction by interchanging social network size and functional social support as two mediators. Results indicated that 'recreational activities' was associated with social network size (B = .938, p = .001, 95% CI = .375 – 1.502), which further associated with functional social support (B = .012, p < .001, 95% CI = .008 – .017) and that further associated with life

satisfaction (B = .224, $p < .001$, 95% CI = .132 − .317). The direct effect between 'recreational activities' and life satisfaction was significant (c' = .065, $p = .003$, 95% CI = .023 − .107). Therefore, the relationship between 'recreational activities' and life satisfaction was serially partially mediated by social network size and functional social support ($a_1d_{21}b_2$ = .003, 95% CI = .001 − .005). Another significant indirect path was found in functional social support, it partially mediated the relationship between 'recreational activities' and life satisfaction (a_2b_2 = .014, 95% CI = .005 − .024).

Figure 4.11 reviewed the serial relationship of 'voluntary work' and life satisfaction by interchanging social network size and functional social support as two mediators. It showed that 'voluntary work' was associated with social network size (B = .594, $p = .015$, 95% CI = .118 − 1.069), which further associated with functional social support (B = .013, $p < .001$, 95% CI = .008 − .017) and that further associated with life satisfaction (B = .234, $p < .001$, 95% CI = .143 − .326). The direct effect between 'voluntary work' and life satisfaction was significant (c' = .041, $p = .025$, 95% CI = .005 − .076). Hence, the relationship between 'voluntary work' and life satisfaction was serially partially mediated by social network size and functional social support ($a_1d_{21}b_2$ = .002, 95% CI = .000 − .004). Similar to the above, the partial mediation effect of functional social support to the relationship between 'voluntary work' and life satisfaction was also significant (a_2b_2 = .007, 95% CI = .000 − .016).

Social Network size

d$_{21}$=.010
(.002)***

Functional social support

a$_1$=1.512
(.282)***

b$_2$=.231
(.049)***

Contacting others through technology

a$_2$=.124
(.017)***

b$_1$=-.001
(.003) n.s.

Life Satisfaction

c'= .021
(.023) n.s.
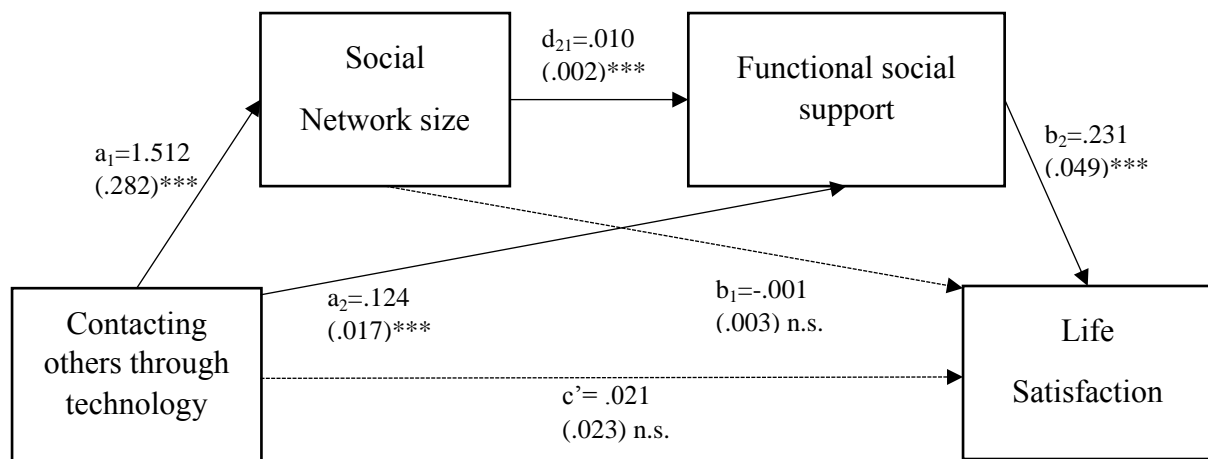
Figure 4-8 Serial mediation model between contacting others through technology and life satisfaction with social network size followed by functional social support as mediators

Note. Numeric values represent regression coefficients and numbers in parentheses represent standard errors. *p < .05, ** p < .01, *** p < .001.

Social Network size

d$_{21}$=.012
(.002)***

Functional social support

a$_1$=.847
(.244)**

b$_2$=.229
(.047)***

Physical activities

a$_2$=.036
(.015)*

b$_1$=-.001
(.003) n.s.

Life Satisfaction

c'= .061
(.018)**
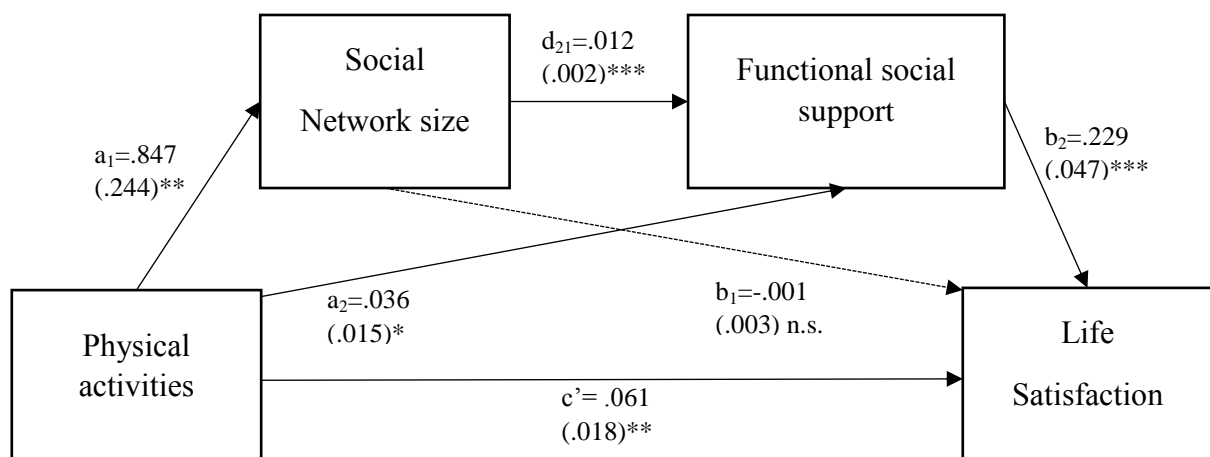
Figure 4-9 Serial mediation model between physical activities and life satisfaction with social network size followed by functional social support as mediators

Note. Numeric values represent regression coefficients and numbers in parentheses represent standard errors. *p <.05, ** p < .01, *** p < .001.

135
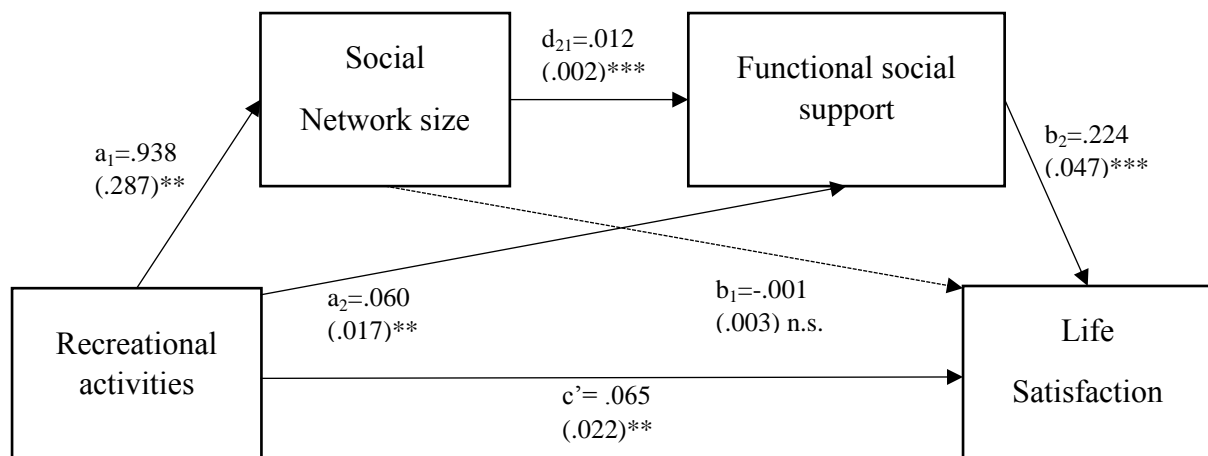
Figure 4-10 Serial mediation model between recreational activities and life satisfaction with social network size followed by functional social support as mediators

Note. Numeric values represent regression coefficients and numbers in parentheses represent standard errors. $*p < .05$, $** p < .01$, $*** p < .001$.
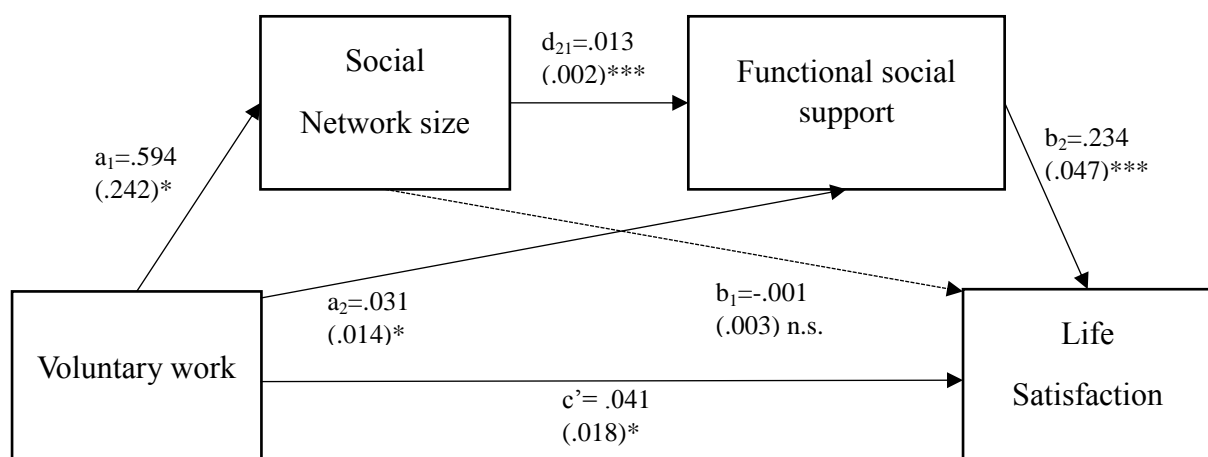
Figure 4-11 Serial mediation model between voluntary and life satisfaction with social network size followed by functional social support as mediators

Note. Numeric values represent regression coefficients and numbers in parentheses represent standard errors. $*p < .05$, $** p < .01$, $*** p < .001$.

Discussion

Several dimensions would be included, namely, the measurement issue of social participation, the clustering analysis and its implications, the impacts and mechanisms of social activity types on life satisfaction of the aged adults. Limitations of Study 1 were provided; key summaries and conclusion were also included.

Scaling dimension of social participation

Given that there has been differential ways to measure the construct of social participation among older adults, to my best knowledge, due to the lack of consensus in defining social participation, there has not been a validated scale. To a certain extent, this dissertation is not aiming at validating the scale of the social participation since the definition of social participation in local context has not yet been discovered. However, it serves as a preliminary investigation in discovering what particular kinds of activity types are most relevant to our aged population. With reference to the taxonomy approach, researching experts and I came up with the consensus that the ten items of social activity type could be most relevant to the old population in Hong Kong. As collected data from 719 aged adults including young-old, regarding the item of political activity, results supported that the older generation did not participate much in it.

This could be explained in both micro and macro levels. Older people tended not to participate in political activity because this group of population, in societal level, was considered as one of the disempowered groups. As people aged, they tended to develop a greater sense of vulnerability, helplessness and powerlessness (Fry, 1989). Although empowerment of older adults have been promoted in many aging concepts like active aging, the rituals of empowerment were usually attributed to productive activities like volunteering instead of specifically political activities. In other words, promotion of political participation has not been a key element in our social political system. For example, in social service field,

it seemed that there is a lack of initiatives in promoting political participation among older adults, and political education is not guaranteed in any core programs (Kam, 1997). Therefore, many older adults have been intrinsically excluded in political system as there have been inadequate supports and concerns in this area.

Another phenomenon is that research tended to support older adults in Hong Kong have been politically inactive regardless of participation types of political activities (Kam, 2000). Research interpreted that political inactiveness could be associated with low education level as well as gender. Typically, it is claimed that political inactivism was prevalent among older generation who were female, relatively older, poorer and less educated (Kam, 2000). Comparatively, our samples comprised mainly female (77.2%), even though the education effect might not be present, the gender effect could be strong enough leading to the fact that only 26% of them reported they have ever participated in political activities. This low level of political participation could further reinforce the exclusion of older adults from the political process as it might be misinterpreted as evidence that they were not willing to participate in political movement rather than insufficiency of opportunities. Furthermore, in this study, the results could also be evidence on challenging the construct of social participation, which has been developing throughout western culture. The perception of how social participation used in this study might be inconsistent with that from the views of local older adults. This requires further study to construct and consolidate the present role of political activities and see how they are associated with the psychological well-being of the older generation.

Besides, it seemed that there is a discrepancy on defining social participation between the view of older adults and the conceptualization by researchers. As reflected from Table 4-5, the remaining nine types of activity were weakly or even not associated with each other. The problem raised in the current study may be attributed to the adoption of

conceptualization of social participation. The whole thesis adopted the ideas of social participation mainly from western literature. The results from the correlation table might serve as a preliminary base that welcomes future studies on investigating how older adults conceptualize social participation in local context.

Social participation clusters and its impacts

With reference to previous evidence (e.g. Croezen et al., 2009), the aims of Study 1a were to uncover the possibility of cluster structure of social engagement patterns among older adults and further investigated any possible differences among them in terms of socio-demographic variables, health outcome and other social determinants.

From Study 1a, using remaining nine types of social activity, two distinct profiles of activity engagement patterns were identified in our local culture. The profiles described the features of both clusters in terms of overall social participation as well as the frequency of participation of each type of activity, most importantly, their concomitant socio-demographic variables and social determinants could also be unleashed.

Generally, western studies tended to reveal several clusters in activity profile analyses (Morrow-Howell et al., 2014). Nevertheless, there were always two polar types of profiles emerged from their studies, namely, highly active older adults and less socially engaged elderly. Studies consistently showed that highly active older adults were usually with better self-perceived health, better objective mental and physical health, less likely to feel lonely and with fewer depressive symptoms (Croezen et al., 2009). In Study 1a, the two polarized group were able to be identified.

Given there were two clusters in Study 1a, the differences in terms of socio-demographic variables among two clusters were first assessed. The only significant difference was found in education attainment. Specifically, individuals in socially-less-active

cluster were less-educated. This could be one of the factors that contribute to reduced level of social participation among all types of activity. Murrell, Salsman, and Meeks (2003) claimed that higher education could provide opportunities for older adults to decide what kind of activities they would love to devote into, in their study, they posited that older adults with greater education level tended to more serene and satisfied in later years and this positive psychological states induced promotion functions as well as protective functions on health indicators. Moreover, another study proved that education level was associated with the volunteering, highly-educated people might be more skilful and better-off in various social systems that allows them to be able to spend time and money in social engagement (Choi & Chou, 2010).

After considering the socio-demographic differences among clusters, the other social determinants and health outcomes were investigated. Briefly, almost all of the hypotheses have been supported in the present study. To be more specific, the above findings suggested that (i) compared with socially-less-active group, socially-active group had significant larger network size, (ii) they contacted their social network more frequently, (iii) they perceived with better social support, (iv) they rated themselves as healthier, (v) they were more satisfied with life.

As reflected in Table 4-6, the activity level of nice types of social activity did not cross with each other among clusters, socially-less-active group did not necessarily equivalent to inactivity at all, they just tended to participate less among all nine types of activity. Moreover, this group of individuals was signified with poor outcomes in self-rated health, social capital as well as psychological well-being. Members of this cluster were more likely to be unhealthier, possessed smaller social network, contacted less frequently with significant others, received less social support, and less satisfied with life. This finding was

consistent with most of the previous studies that relatively inactive older adults would be more vulnerable to poor outcomes and indicators.

Regarding health indicator, consistent findings supported poorer health was reported among those who were socially inactive (Lee et al., 2008). As association between these two factors have been generally supported, these two factors should influence with each other and the mutual effects might be over-magnified. Yet, some studies resolved this dimension, for example, Freysinger and Stanley (1995) found that even though there were changes in age and health status, participant maintained their social participation level. These studies provided insights that social participation could help older adults to deal with health changes, that is, older adults might be able to gain more health-related knowledge, participate in more health-promoting behaviours and develop a positive sense of body through frequent social participation. Furthermore, healthier individuals would be more willing to participate in social activities even though progressive aging might lead to reduction in participation rate, however, those who were initially with poorer health status would be more prone to inactivity. The vicious cycle in this gap would be strengthened as people age.

Concerning social determinants, to recap the differences, socially-active cluster did have a larger social network, with greater contact frequency with network member and received better functional social support. Although SST postulated that as people age, their social network size would be reduced due to altered investment in human resources, this theory tried to compare the structure and size of network between younger and older generation within life course. However, when only considering the older cohorts, they were indeed still eager and competent enough to broaden their social circles (Ziegler, 2012). Moreover, social participation could induce social interactions, in any forms of activity types, through discussion or socializing with each other and exchange social support from them.

This could buttress the results of why socially-active cluster possessed greater structural social support and functional social support than those who were relatively inactive.

Socially-active group rated significantly better in life satisfaction than the counterparts. Some studies have provided evidence that social participation contributes to life satisfaction and health (Heo, Stebbins, Kim, & Lee, 2013). The results of this study consolidate the idea that older adults who are active in engaging different types of activities may benefit in the areas of life satisfaction and health. This finding was consistent with previous studies consolidating that the quantity of social participation plays an important role in affecting the well-being of older adults. More importantly, it agrees with the notion that life satisfaction and health are important aspects of successful aging; the present finding supported the reciprocal relationships between these variables.

Socio-demographic variables and their impacts

A series of two-stage hierarchical multiple regression were performed with life satisfaction as the dependent variable. Socio-demographic variables were entered at stage one of the regression, then each kind of social activity was included at stage two. Several socio-demographic variables were associated with life satisfaction in stage 1. Specifically, life satisfaction was higher among participants who were not retired or housewives, married or widowed (compared with those whose status rated as others), with secondary level of education (compared with those who did not take any education), perceived with sufficient amount to spend and perceived themselves as healthier.

Gender was not associated with life satisfaction in our samples, the results of previous studies were found to be mixed as well. Some studies suggested that women were tended to be less satisfied because they were more likely to be widowed, with higher morbidity rates, fewer material resources, more likely to disclose negative feelings and more value on their

142

self-image (Pinquart & Sörensen, 2001). However, other studies suggested that women might also be more responsive to positive events, this perceptual ability might buffer the impact of negative events.

In general, findings from previous research suggesting that education level is positively associated with life satisfaction among older adults (Strine, Chapman, Balluz, Moriarty, & Mokdad, 2008). However, in our samples, contradictory finding was shown to be significant only in participants with secondary level of education compared to those who had no education. The inconsistent results may be justified by the cohort effect as our samples are site-specific, which is not a national-wide sample.

Our findings showed that married or widowed older adults were significantly more satisfied than older adults with other marital status. This result was consistent with many previous studies that marital status was an essential determinant to life satisfaction in Asian country, Asian people emphasized on the bonding of family members who could contribute to their life satisfaction by provision of support (Ngoo, Tey, & Tan, 2015). Moreover, as the cohorts of the study were older adults, there was also a high expectation from the family that adults should get marry when they reach certain age, distress from family members or from the society would be resulted if they remained single. However, in a longitudinal study, life satisfaction was associated with marital status only in female participants but not in male participants (Chou & Chi, 1999). As our samples consisted of large proportion of female respondents, this could justify why life satisfaction was found to be related with marital status.

Expenditure was significantly associated with life satisfaction while income was not associated with life satisfaction. It is common that, in our sample, the majority of the respondents were retirees (i.e. 94.4%) and most of them earned fewer than $6000 per month, financial strain has been found as one of the common predictor to life satisfaction in Hong

Kong (Chou & Chi, 2002a). Previous studies supported that Hong Kong elderly people were more likely to suffer from financial difficulties as there were no adequate retirement scheme and the their income was relatively lower or fixed at a low level. Given that they might not earn much in the current situation, the subjective evaluation of whether they had sufficient to spend played a more essential role in associating with life satisfaction. Lower life satisfaction might be resulted by fewer opportunities or hopes for improving the economic conditions, but some studies provided support on cohort effect, claiming that some older people would be satisfied with the present conditions because there was a sharp contrast between current and past financial situations. Other literature has also indicated that older people would maintain high life satisfaction even at very low levels of income, scholars attributed this phenomenon to accommodative strategies including rescaling their goals and rearranging their standards (Hansen, Slagsvold, & Moum, 2008).

The greatest standardized beta weight of indicators was found to be self-rated health in the present study. Positive perception of health was associated with life satisfaction in our samples, this result supported the findings from previous studies (Adam et al., 2016; Chou & Chi, 2002b). Health maintenance and/or optimal functioning have been consistently underscored as one of the key components in differential theories on successful aging. Thus, it was not surprisingly that older adults who believed themselves have met certain standards in health status would report greater life satisfaction.

Social activity types and their impacts

The key purpose of the study was to identify which activity type was associated with life satisfaction among older adults. Five types of activity were found to be associated with life satisfaction after controlling for the socio-demographic variables, namely, contacting others through technology, physical activities, cultural activities, recreational activities and voluntary activities.

Contacting with others through technology might involve the usage of internet, some studies claimed that online communication might be impersonal or unfriendly (Moyle, Jones, Dwan, Ownsworth, & Sung, 2018). On the contrary, other studies found that older adults could establish positive social effects on both individual level and group level via using online communication since it could solve geographical boundaries and enhance more positive social communication with others (Yang, Zhang, & Wang, 2018). This study confirmed this proposition that the greater frequently use of technology to contact others could enhance life satisfaction among the older adults.

Physical activities have long been identified as one of the crucial activity types that could benefit older adults both physically and psychologically (Rejeski & Mihalko, 2001). This study was consistent with previous studies, it was found that greater rate in participating in physical activities could enhance life satisfaction among older adults. Some experimental studies also consolidated the relationship, they found they older adults participated in physical activity reported improved life satisfaction when compared with control group, but this effect might be moderated by the intensity of the training program (Mihalko & McAuley, 1996). Moreover, some scholars argued that the enhancement of life satisfaction should be attributed to enjoyment rather performance of the particular activity type (Peppers, 1976). As life satisfaction is a subjective outcome which could be heavily influenced by social cognitive variables including social support, these social cognitive variables might even play more essential roles in mediating the effects between physical activities and life satisfaction.

Cultural and recreational activities were found to be associated with life satisfaction among older adults in the study. These results were also consistent with previous studies. One local study conceptualized these activities as leisure participation and found that older adults were more involved in activity of watching television or listening to radio (Chou, Chow, & Chi, 2004). Another study revealed that high culture activities could benefit life

satisfaction among older adults because essentiality, conceptualized as maintain role expectation and competency, was the key leisure benefit of the mechanism beyond the positive relationship (Nimrod, 2007). Furthermore, participation in cultural activities might induce a greater participation in other activities like physical activities since cultural events were thought to be a marker for healthy lifestyle (Bygren et al., 2009). The interrelated relationships might explain the greater indication of life satisfaction for those reported with greater participation in these two kinds of activity.

Voluntary work was found to be associated with life satisfaction among older adults in the present study. This was also consistent with many other studies especially those advocating productive aging (Warburton & Nancye, 2008). Willigen (2000) suggested that older volunteers reported greater life satisfaction because they could maintain their roles and remain active in different organizations. Yet, volunteering in different types of organizations might lead to different impacts on well-being, this might be dependent on how older adults choose to volunteer for. Psychologically, voluntary work might provide a medium for older adults to develop a more positive life and consequently foster development of self-worth and social values which were essential factors in influencing life satisfaction (Du & Wang, 2013).

Mediating factors influencing the relationship between social activity types and life satisfaction

One of the main goals in Study 1b was to investigate how different types of social activities contribute to the life satisfaction through other social determinants as discussed in conceptual models. First of all, in general, results consistently revealed that all social activity types were positively associated with total network size and functional social support except cultural activities. This suggested that older adults with more frequent rate of social participation could enlarge social network circle as well as take functional social support from it. Similar findings were found in other studies. For example, higher chances of

participation in various activities were observed in older adults who developed a greater diversity of social capital as they were more likely to form association with others (Legh-Jones & Moore, 2012). Furthermore, social support could be received when older adults were able to invest time and efforts on social activities (Cheung & Ho, 2012).

Regardless of which mediation models, although social activities were associated with both social network size and functional social support except the cultural activities, social network size was, unexpectedly, consistently insignificantly associated with life satisfaction. In general, researchers suggested that structural social support promotes positive psychological outcomes and through social participation, social network ties should be fostered so that meaningful roles could be facilitated and maintained (Cohen, 2004). Yet, the number captured as social network size per se in this study could not benefit life satisfaction of individuals since larger network size might not be equivalent to greater satisfaction towards the social ties (Yuan, 2016). Moreover, larger network size might not imply greater social contact frequency and even if there could be greater social contact frequency, they may simultaneously encourage positive and negative behaviours that may confuse our negative results (Berkman et al., 2000).

Study 1b also underscored the importance of the relationship between functional social support and life satisfaction among older adults. Older adults could receive actual exchange of different sources of support during interacting with significant people. For example, instrumental support were received from friends in older adults while life satisfaction was enhanced when they were able to maintain close relationship with family members (Reinhardt, 1989). Thus, it could be postulated that life satisfaction was not directly related to the objective characteristics of the social relationships but it could be more important on how the older adults evaluated and appraised them in the interactive process.

Competing mediation models on the relationship between social activity types and life satisfaction

The hypothetical models in explaining the serial mediating effect between social activity types and life satisfaction among older adults were significant. Interestingly, fully serial mediation was observed in one activity type while partially serial mediation was found in the other types. Specifically, fully serial mediation was found only in (i) contacting others through technology, while partially serial mediation was found among (i) physical activities, (ii) recreational activities and (iii) voluntary work.

Concerning cultural activities, the relationship was fully mediated by functional social support only. Yet, the other four kinds of activity could boost the social network size which in turn could enhance the received functional social support that could lead to better life satisfaction among older adults.

This study provided a few insights to the society as well as the gerontological literature. First, it served as a pioneer study on investigating which types of activity could be associated with the psychological well-being among older adults. Noticing the positive association between specific types of activities and psychological well-being, policy-makers or stakeholders could focus on developing programs to foster the chances of participation. Realizing which types of activity are beneficial to their well-being could both maximize the gains of older adults and minimize the costs burdened by the society.

Second, it also provided a possible mechanism on how social participation contributes to psychological well-being for older adults. To recap, one of the potential mechanisms is that social participation enlarges social network size, which allows them to gain social support from it and that leads to life satisfaction. This contributes to the literature by proposing the possible pathway of how social participation leads to psychological well-being.

Third, it also compared the importance between structural and functional support. Results suggested that social participation could foster both structural and functional social support, structural social could also facilitate functional social support, but only functional social support could finally lead to life satisfaction. It warranted that both types of social support might operate in a different, yet, mutually beneficial manner. Furthermore, all models seemed to highlight greater emphasis on functional social support than structural social support reflected by the results that even social activities might promote both types of social support, only functional social support was found to be associated with life satisfaction. It was plausible to argue that functional social support could be a more proximal indicator of psychological well-being of older adults as suggested in the literature (Douglas et al., 2016).

Limitations of Study 1

There are several limitations in Study 1a and 1b. First, I adopted the taxonomy of social activities as a whole to measure social participation while other studies listed out dozens of specific activity and I took the frequency of the type of activity for analyses. This approach relied on subjective perception of how participants perceive each kind of activity without specifically asking them to list out all possible activities under each type of activity. In future studies concerning changes and patterns of activity, qualitative research could be introduced as it might explain why certain cohorts of aged population could carry out certain kind of activities while some remain inactive even degeneration has been stable.

Second, the Chinese version of the scale measuring social participation has not been validated. Moreover, the psychometric properties showed that those items were weakly or even not correlated with each other. This might challenge the perceptions of social participation as most of the literature focused on western cultures. Future studies might need to be done on investigating the uniqueness of social participation among Chinese culture.

Third, as I did not recruit samples from every district, the findings of distribution of clusters might only be distinct to this study. This might limit the generalizability of the findings. Due to the lack of resources and the problem of time costs, a more comprehensive sampling strategy could be adopted for a clearer picture of social activity profiles among older adults in Hong Kong.

Fourth, I only took life satisfaction as an outcome for investigation of subjective well-being, which was considered as a cognitive evaluation of life, it could be argued that other emotion indicators might also be worth studying. Owing to the nature of the questionnaire, the targeted variables were embedded in the original set of questionnaire which involved many pages in capturing the perception of age-freindliness in Hong Kong. A more practical point to be noted was that older adults would be fatigue if the questionnaire was set to be too lengthy. Hence, future studies could be done by only incorporating the targeted variables as well as other psychological constructs including emotions and happiness for a more all-round picture.

Fifth, there was an assumption in this study that those who were socially active should have a larger network size, but this effect could be eliminated if individuals were only devoted to a few significant others as suggested by SST. Moreover, cross-sectional nature of the study might constraint the interpretation of the mediation models. Hence, future longitudinal investigation could be done for better understanding on the relationship between how social network changes and how social participation changes interfered with each other and their impacts on the well-being of older adults.

Lastly, another premise was that, theoretically, the model suggested that social participation is the more distant variable, while social support is the more proximal variable, in facilitating the psychological well-being of the aged adults. Nevertheless, in this study, I

did not capture negative aspects of social support. There could be the possibility that the negative aspects of social support could bring harm to well-being of older adults but whether these kind of negative aspects were considered as a proximal factor in affecting well-being should need to be further investigated.

Summary

This Chapter covered the main results of Study 1 including the cluster analysis and model testing analyses among aged adults. Most of the hypotheses were fully or partially supported. Regarding Study 1a, H1.1 – H1.4 were fully supported. In Study 1b, H1.5, H1.7, H1.8a and H1.8b were partially supported depending on the types of activity while H1.6 was fully supported.

As shown in Study 1a, by using the participation frequency in different social activity types to categorize sub-groups of older adults in Hong Kong, two groups of them were identified, namely, socially-active group and socially-less-active group. Consistent with many of the previous findings, socially-active older adults tended to be inherently more educated and had better health status. Moreover, they possessed more network members in their social circle and perceived themselves with better social support. Most importantly, with better life satisfaction which was considered as a well-being component of successful agers. Thus, the key ideas of study 1a is that old adults with greater social participation should have more benefits including more social recourses for social support and perceived better on evaluation of their life status, yet, these benefits are not necessarily bound by socio-demographic variables.

Study 1b extended the investigation on how social determinants contributed to the relationship between different types of activities and life satisfaction among Hong Kong Chinese older adults. It further contributed to the gerontogical field of aging research on

delving into the possible mechanisms. Activity types including physical activities, recreational activities and voluntary work were found to be associated with life satisfaction; yet, these relationships were partially serially mediated by social network size and functional social support or partially mediated by functional social support. Another activity of contacting others through technology was not directly associated with life satisfaction, but the relationship was also fully serially mediated by social network size and functional social support or fully mediated by functional support itself. For cultural activities, only functional social support fully mediated the relationship. Apart from simply replicating findings from previous studies, this study weighed the importance of different social determinants and provided justification on which social variables could be more proximal to psychological well-being among the Hong Kong older adults. Study 1b consolidated that both effects of structural and functional social support were indispensable.

Chapter 5

Study 2

Introduction

Study 2 aimed to *(a) to examine the presence of the effects of priming negative aging stereotype on episodic memory using an implicit priming task* and *(b) to investigate whether social participation moderate the effect of (2)(a).* Study 2 utilized an experimental design to capture the objectives. In this chapter, the related details of methodology of study 2 were first discussed followed by the results and discussion.

Study 2

Participants

Study 2 recruited participants from the Institute of Active Aging (IAA) of the Hong Kong Polytechnic University. The experiment was first promoted by the institute using internal email system and participants were recruited through phone calls using convenience sampling. The ethical review of experiment was approved by the Human Subjects Ethics Sub-committee of Hong Kong Polytechnic University Research Committee (Project ID: HSEARS20170227009). Participants, who were aged 55 or above and did not report any difficulties in mental and physical aspects, were all welcomed to take part in the study, exclusion criteria included those who reported with difficulty on using computer, eyesight problem and mental illnesses. Most of the participants were successfully recruited by the IAA and some participants were recruited by referrals through snowball sampling. As most of the participants were recruited through the IAA, they were generally well-educated and were young-old.

Sampling method

The present study adopted an experimental design with the aim of investigating the effects of priming age stereotypes on memory performances among older adults. There were two groups in this study, the negative age stereotype primed group (experimental group) and the neutral word primed group (control group). As mentioned, participants were mainly

recruited by the Institute of Active Aging of the Hong Kong Polytechnic University using convenience sampling. During the progress of the month-lasting experiment, some other participants were recruited by referrals through snowball sampling as well. A prior power analysis was performed that a total sample size of 92 subjects were required to have 95% power for detecting an effect size of .38 as reviewed in meta-analysis when taking $\alpha = .05$ (Horton et al., 2008). 110 participants were drawn from the recruiting pool to take part in the study to ensure the sufficiency of sample size. Registered participants were transformed into number and inputted in excel file in computer, they were randomly assigned to either a value of 1 (experimental group) or 0 (control group) by randomly number generator.

Design and experimental manipulations

The present study was a between-subject design where participants were randomly assigned to either one of the two conditions. The Montreal Cognitive Assessment (MoCA) is used as a baseline assessment to ensure participants were mentally healthy. It is a 10-min test that evaluates several cognitive domains with a total score of 30. The Hong Kong version is validated and is available at the MoCA official website (Wong et al., 2009).

The implicit priming procedure was adopted from an original study (Levy, 1996). It was performed using the E-prime 2.0 software (Psychology Software Tools, 2012). To ensure the primes flashed on screen were beyond awareness, the similar adjustment procedure was taken (Stein et al., 2002). An individualized stimulus onset asynchrony (SOA) was determined in each trial block in which a total of ten neutral words will be flashed either 1 cm above or 1 cm below the cross-point (centre) in each trial. Participants were required to focus on the cross-point and to respond to the computer by pressing the designated keys as quick and accurate as possible. Patterned masks (rows of at signs:@) were used before and after each flash of word, this patterned mask has been one of common masks used in priming

study of Chinese language, appeared before and after each target prime was presented (Chen, O'Séaghdha, & Chen, 2016).

Priming Stimuli

For experimental manipulations, negative age stereotype primes were taken from Levy's study while neutral words were adopted from the most frequent word used in Chinese context (Xian dai Han yu chang yong ci biao ke ti zu, 2008). The priming procedure was extended in which 4 blocks of 40 trials were presented at the individualized SOA. The priming task was intensified based on Levy's priming paradigm as it is intended to exacerbate the priming effects as well as to counter-balance the number of trials in each two blocks so as to avoid fatigue and tendency of pressing the same key.

During each trial, similar to the prior individualized procedure, participant was asked to indicate whether the stimulus was flashed above or below the cross-point. The typical flow of each trial is shown in Figure 5.1.

To ensure the words are relevant to the Hong Kong elderly population, a list of 66 words (22 words are positive, 22 words are negative and 22 words are neutral) was generated. These 66 words were presented in Table 5-1 – Table 5-3. 16 participants who are aged between 50 and 69 helped rate each of the word according to its relevance to oneself in a 7-point Likert type scale ranging from 1 indicating ('very positively related to you') to 7 ('very negatively related to you') while the score of 4 referring to ('irrelevant to you'). The negative words and neutral words rated with highest frequency are used in the present experimental priming manipulation. The final version of words selected for the priming task was shown in Table 5-4.
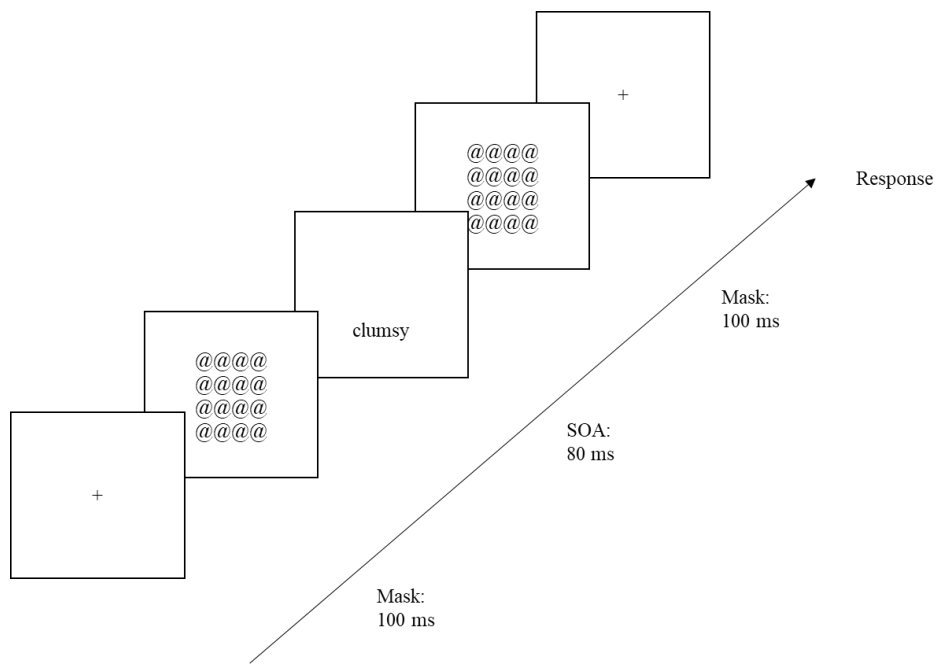
Figure 5-1 An example of the flow of the masked priming for one typical trial

In the negative age stereotype priming condition, 40 trials consisted of (i) 12 negative-age-stereotype primes (repeated once); (ii) 2 highly rated negative-age-stereotype primes (i.e. dementia and clumsy) (repeated twice); (iii) 4 selected neutral words (besides, sentence, moreover and even) (repeated once). More specifically, 12 negative age stereotype primes and 4 neutral words would be presented twice and 2 highly rated negative age stereotype primes would be presented in four times which constitute 32 trials and 8 trials respectively out of 40 trials in each block. In the neutral condition, 20 neutral words would be presented twice in each block, in other words, 4 blocks of the 40 neutral words were flashed randomly.

After responding to the 40th trial in each block, four emotional words (two are negative and two are positive) were randomly presented to the participants, they were asked to rate whether the targeted words are positive or negative. Since there were four blocks in this priming task, there were 16 emotional words to be presented. These words were presented in Table 5-5. As Fazio, Sanbonmatsu, Powell, and Kardes (1986) suggested, individuals who were negatively primed would tend to respond to the negative words in a quicker manner,

which could be proved as the activation of negative stereotype in subliminal level. The

reaction time and correct rate of clicking the flashes were presented after finishing the whole

task.

English	Chinese	English	Chinese
Satisfied	滿足	lively	精神
Smart	醒目	creative	創意
Wise	明智	intelligent	智慧
Mature	成熟	Active	活躍
Improvement	進步	Young	年輕
Energetic	活力	fundamental	基礎
Persistent	堅持	Contributive	貢獻
Healthy	健康	Strong	強壯
Studious	好學	Plentiful	充沛
Enthusiastic	熱情	Flexible	靈活
Perseverant	堅毅	Adaptable	變通

Table 5-1 The selected positive age stereotype words for evaluation

English	Chinese	English	Chinese
Wrong	錯誤	Ill	患病
Dependent	依賴	Confused	混亂
Ruthless	無情	Sickly	多病
Forgetful	遺忘	Old	老邁
Weak and old	老弱	Feeble	衰老
Deteriorated	惡化	Incapable	無能
Detached	冷漠	Intense	緊張
Insufficient	不足	Dementia	癡呆
Careless	疏忽	Patients	病人
Stupid	笨拙	Older adults	長者
Weak	體弱	Elderly	老人

Table 5-2 The selected negative age stereotype words for evaluation

English	Chinese	English	Chinese
Direction	方向	Basic	基本
Possible	可能	Middle	中間
First	首先	Future	即將
If	如果	We	我們
Even	甚至	Sentence	句子
Always	一直	Moment	時候
All	全部	Besides	另外
More or less	多少	Moreover	而且
Theory	理論	Whole	全面
Must	一定	Together	共同
Result	結果	Unless	除非

Table 5-3 The selected neutral words for evaluation

Procedures

The experiment was divided into three sections: pre-priming test, (ii) the priming task & (iii) memory assessment. The experiment lasted for around 2 hours and its research flow was presented in Figure 5.2. Participants first completed informed consent followed by the MoCA and simple visual acuity test using "Tumbling E" Eye Chart. The simple visual acuity test was chosen to ensure participants did not possess severe problems on eye-sight so that they were able to perform the priming task on the computer screen (Claesson, Blomstrand, Eklund, Eriksson, & Dahlin-Ivanoff, 2013). MoCA test served as a prior cognitive examination as a screening tool for mild cognitive impairment and was taken as a baseline for further analyses. A simple eye test using Visual Acuity Test was performed to ensure that participants could identify words in small font size.

Then participants entered the trial session for determining personal SOA before the priming stage. This stage was framed as a reaction time test in which they were asked to press the appropriate key as accurate and fast as possible using their individualized SOA. This deceptive note was also put on the information sheet in order to avoid contamination of the present priming manipulation. Participants were not informed anything regarding experimental conditions and were then randomly assigned, according to previously

Domain(s)	Items
Negative age stereotype primes (14 words)	痴呆、笨拙、老弱、衰老、老邁、無能、體弱、惡化、多病、遺忘、錯誤、混亂、冷漠、患病
Neutral primes (20 words)	另外、而且、甚至、句子、全部、如果、一定、可能、時候、多少、中間、基本、理論、即將、一直、全面、方向、我們、共同、首先

Table 5-4 Negative age stereotype primes and neutral words used for priming task

Positive emotional words		Negative emotional words	
English	Chinese	English	Chinese
Excited	興奮	Sad	傷心
Happy	開心	Angry	憤怒
Relaxed	輕鬆	Scared	害怕
Satisfied	滿足	Worried	擔心
Delighted	喜悅	Sorrowful	悲哀
Blessed	恩惠	Distressed	苦惱
Well	幸福	Puzzled	困惑
Joyful	愉快	Depressed	憂鬱

Table 5-5 Emotional words to be presented after each block

drawn number, to either neutral age stereotype prime group (control group) or negative age stereotype prime group (experimental group). During the trial session, participants were presented with 10 neutral words followed by the emotional word rating, they would be asked whether they have clearly identified 10 neutral words, if they could correctly report verbally with more than 1 word, the SOA would be reduced for another trial, another set of 10 neutral words were presented. This procedure was repeated until they could not correctly identify more than 1 word out of 10 neutral words, then the SOA was determined. For the emotional word rating session, to avoid contamination, the program has been set to show either 'positive' or 'negative' instead of asking them to evaluate emotional words, this procedure served as a practice trial to ensure that they have acquired certain knowledge on the experimental

procedures. As the priming task was framed as a reaction task, the percentage of correct hits and response time will be shown at the end of the task.

The Hong Kong List Learning Task (HKLLT) was implemented immediately after the priming session. All task instructions were standardized and computerized according to the manual of HKLLT by using E-prime 2.0. During the first learning trial, participants first listened to the 16 target words and were asked to record the words aloud to the microphone. No feedback was gained by the examiner or no extra information was presented by the computer screen. The procedure was repeated in the second and third learning trials by only telling the participant to listen and remember the 16 target words. During each attempt, a one-minute period was given for participants to record the words, their recordings were captured by both the computer as well as the examiner who was sitting at the back of the room. It acted as an insurance basis just in case the recording from the computer was failed. Participants were able to report words after 1 minute if requested. This procedure repeated in second and the third learning trials. After three learning trials, participants were asked whether they have been using any strategic methods to memorize those words. Participants reporting using no strategy during learning trials were excluded in this experiment since they recalled notably very few words in all trials (n = 5) as shown in bottom part of Figure 5.2.

After the learning trials in the HKLLT, participants were asked to fill a set of questionnaire including socio-demographic information and other scales such as frequency on social participation. Without prior notification, participants were asked to stop filling the questionnaire and asked to recall the list of words again after 10 minutes and 20 minutes further (i.e. 30-minute delayed recall). During the recall tasks, they were given 1 minute to recall any words that they retained, extra time was given if they still wanted to report words. The recognition task was immediately performed after the 30-minute delayed recall. The remaining time will be given for completion of questionnaire if necessary. After signing the

receipt of coupon collection, the debriefing session was given in which the research flow was

explained. Participants were also asked not to confide any details of the study.
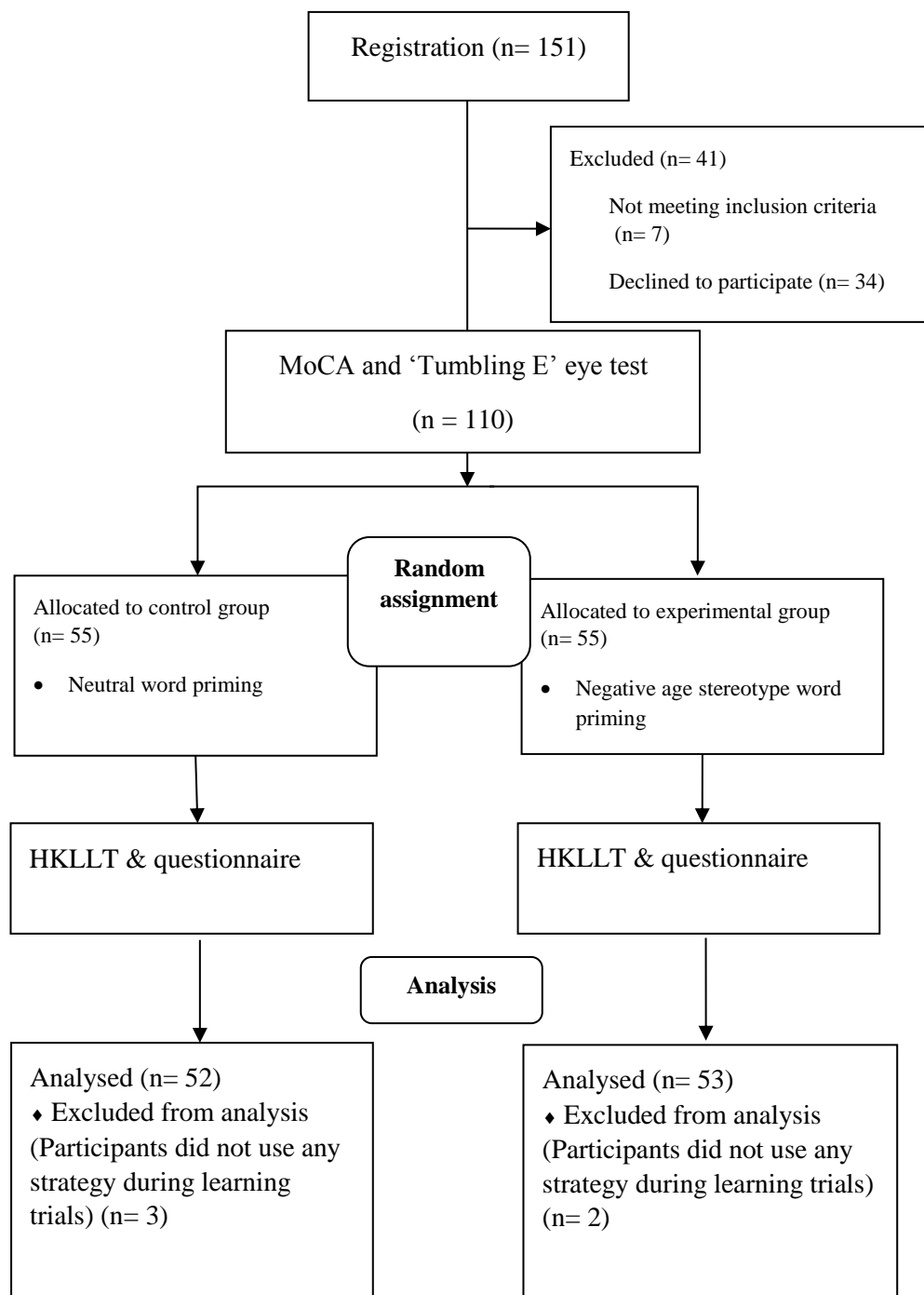
Figure 5-2 Research flow of the study 2

Measures

There were three stages in this experiment: (i) pre-priming test, (ii) the priming task & (iii) memory assessment. MoCA was used during pre-test stage while reaction time task was taken during the priming manipulation. HKLLT was taken as the key variable on measuring memory performances. Participants were also asked to fill in a set of questionnaire including a number of self-rated measures on capturing social indicators. The rationale and details of each instrument are discussed as follow.

Montreal Cognitive Assessment (MoCA)

MoCA is used as a brief and potential screening tool for detecting mild cognitive impairment (MCI) and Alzheimer's disease (AD) has been validated in Hong Kong. As mentioned previously, it is a 10-min test that evaluates several cognitive domains including items of Visual-spatial and executive functioning, naming, attention, language, abstraction, delayed recall and orientation. Visual-spatial and executive ability comprise three items, the first item requires participants to draw a line according to a pattern of beginning with a number in white circle followed by a number in shadowed circle and so on. The second item requires participant to simply copy the cube in the designated place and the third requires participants to draw a clock with specific instructions. Three animals are given to the participants for naming. Two trials of 5 words would be read by examiner to participants for delayed recalled session later on. Attention items include two digit span questions, one scoring question and one vigilance question. Participants need to repeat 5 digits in a forward manner and 3 digits in a backward manner. . Vigilance was administered by reading out a list of numbers, participants need to respond by tapping their hands whenever a '1' is heard. Scoring question require participants to count number by subtracting sever from one hundred for five consecutive trials. Language items comprise sentence repetition and verbal fluency question. Participants need to repeat two sentences reported by the examiner followed by a

minute recalling any words about animals. Abstraction involves two items by providing two words and asking participants to identify their commonality. Delayed recall requires participants to recall those five words given previously. The last session is orientation, this requires participants to report the date and location. This test constitute a sum score of 30, and a sum score of less than 22 is considered as a cut-off in Hong Kong (Yeung, Wong, Chan, Leung, & Yung, 2014). All items were standardized and the procedure of administering each item has been consistent with the online manual as shown in Appendix A.

Hong Kong List-learning test (HKLLT)

The Hong Kong List Learning (HKLLT) is a validated tool for assessing episodic memory for aged Chinese speaking adults (Chan, 2006). The random control list was taken in this study. It comprises 16 words formed by four categories: *family member (grandmother)*, *country (Chile)*, *furniture (wardrobe)* and *vegetables (cucumber)*. All words are in random order such that no words within the same category are presented consecutively. Three attempts were presented to participants and the total learning score (out of 48) was computed over three trials.

It also involves 10- and 30-minute delayed recalls followed by a recognition task. These recall sessions require participants to think of the strategy they used to remember those 16 words and they had to report as many words as they could remember within 2 minutes. The recognition task requires participants to indicate a list of 32 items, half of them are targets while half of them are foils, in a yes or no manner. Discrimination score was calculated as it considers both correct hits and false alarm errors.

The HKLLT is adopted as it is a validated tool in Hong Kong as well as it enables researchers to dissect how negative age stereotype priming affects different stages of the memory task.

Other variables

Other variables including sociodemographic variable, social-related variables were included in the questionnaire, these variables were the same as measure in Study 1.

Data analysis plan

Analyses were performed using SPSS, version 25. Multiple independent samples *t* tests and chi-square independence tests were done on investigation of differences in socio-demographic characteristics, baseline assessments as well as priming manipulation. Analysis of Co-Variance (ANCOVA) was used to test group differences in memory performance as the MoCA result was used a control variable.

The total learning score, two delayed recalls or total delayed recall and discrimination score in recognition trial were taken as dependent variables while the average score of social participation frequency was taken as moderator for moderation analyses using the SPSS macro PROCESS (model 1) (Hayes, 2018). The adoption of PROCESS model is justified since social participation was a continuous variable, traditional moderation by manually splitting a continuous variable in to categorical variable could be erroneous. Therefore, PROCESS model was taken for analyses since it allows researchers to use continuous variables for moderators as well as probing the interaction, if any, by using Johnson-Neyman (*JN*) technique.

Results of study 2

Descriptive results

There were 110 participants included in this experiment and were randomly assigned to either experimental group or control group. However, some participants (n = 5) reported that did not adopt any strategies in remembering the words during the experiment, yielding 53 of them in the experimental group while 52 of them were in the control group.

Descriptive statistics across groups were shown in Table 5-6. In general, the majority of participants were married, retired and with considerable amount of income, rated themselves as fair in health condition, rated just enough to spend for expenditure. Independent t-tests among continuous variables were shown in Table 5-7. There were no significant differences among age, education level in years, self-rated health, and expenditure across groups. Age, gender, education years and health status were taken as covariates for further analyses as they were associated with older adults' memory performance (Van Hooren et al., 2007)

MoCA was used as a brief and potential screening tool for detecting mild cognitive impairment (MCI) and Alzheimer's disease (AD), which has been validated in Hong Kong (Wong et al., 2009). As mentioned, the total score of MoCA is 30 while the cut-off score of MoCA has been generally set as 22 in Hong Kong (Yeung et al., 2014). Another study was also done to indicate the cut-off score of MoCA based on age and education level in local context (Wong et al., 2015). Comparing our samples to the norm, the mean age and mean years of education of the samples were 65.25 years old and 13.21 years respectively. By considering the norm table established by Wong et al. (2015), the 16th, 7th and 2nd cut-off for this group were 25, 23 and 21 respectively. Referring to Table 5-7, all participants in both conditions passed this cut-off score ($M = 27.55$, $SD = 1.46$). As a baseline measure, the difference in MoCA score was found to be marginally significant [$t (103) = 1.79$, $p = .076$], the control group did marginally better than the experimental group in MoCA. Since MoCA is a cognitive test consisting of memory items, to ensure the effect of priming manipulation on memory performance in HKLLT, the MoCA score in baseline was considered as a co-variate in further analysis.

Table 5-8 showed the results of investigating differences among categorical variables across groups using Chi-square test. For the variable of marital status, since it violated the assumptions of Chi-square test with fewer than 5 counts in several cells, marital status was

167

categorized as married or non-married in this analysis. Among all categorical variables, there were no significant difference across groups except one marginal difference was found in income group [χ^2 (2) = 4.96, p = .084].

Manipulations of social participation and results

Table 5-9 – 5-10 showed the frequency of participating in social activity types among control group and experimental group respectively. The similar items were used in this experimental study to capture social participation. Similarly, the skewness and kurtosis of each item were first checked. Results indicated that all items were within range of |2| in the skewness and the range of |3| in kurtosis. Table 5-11 showed the correlation among these items. The internal consistency among 10 items was checked by internal consistency reliability test, where the result revealed that the internal consistency reliability was α = .72. The inter-item correlation was .21 which has been considered as an acceptable range (from .20 to .40) with reference to the standard set by Clark and Watson (1995). Hence, in study 2, social participation would be conceptualized as the average of participation frequency among 10 social activity types.

Multiple independent samples t-tests of 10 social activities and the average score of social participation were performed. Results were shown in Table 5-12. There were no significant difference across most of the activity types across experimental conditions except the item of 'religious activities', the control group reported that they participated more religious activities than the experimental group [t (103) = 2.05, p = .043]. Since only difference in religious activities reached statistical significance, there was no significant difference in terms of average social participation of 10 items, therefore, the average social participation frequency would be taken as the only variable for subsequent analyses.

	Control Group (n = 52)	Experimental group (n = 53)
Variables	Percentage (%)/Mean (*SD*)	Percentage (%)/Mean (*SD*)
Age	65.15 (2.55)	65.40 (3.10)
Gender (male)	48.1	50.9
Education (in years)	13.46 (2.85)	12.96 (2.67)
Marital status		
Single	1.9	15.1
Married	78.8	69.8
Widowed	7.7	3.8
others	11.5	11.3
Job status		
Retired	90.4	83.0
Part-time worker	9.6	17.0
Income group		
<$6000	34.6	47.2
$6000-$14999	26.9	34.0
>$14999	38.5	18.9
Expenditure	3.42 (.70)	3.19 (.86)
Self-rated health	2.87 (.93)	3.11 (.78)
MoCA score	27.81 (1.55)	27.30 (1.34)

Note. The composite percentage may not be 100% due to rounding off issue

Table 5-6 Socio-demographic information of the participants across groups

	Control Group (n = 52)	Experimental group (n = 53)	Statistics		
Variables	Mean (*SD*)	Mean (*SD*)	*t*	*df*	*p*
Age	65.15 (2.55)	65.40 (3.10)	-.44	103	.66
Education (in years)	13.46 (2.85)	12.96 (2.67)	.93	103	.36
Expenditure	3.42 (.70)	3.19 (.86)	1.54	103	.13
Self-rated health	2.87 (.93)	3.11 (.78)	-1.48	103	.14
MoCa score	27.81 (1.55)	27.30 (1.34)	1.79	103	.08

Note. * *p* < .05, ** *p* < .01, *** *p* < .001

Table 5-7 Independent t-tests across continuous socio-demographic variables across groups

Variables	Control Group (n = 52) Percentage (%)	Experimental group (n = 53) Percentage (%)	$\chi 2$	df	p
			Statistics		
Gender (male)	48.1	50.9	.09	1	.77
Marital status			1.12	1	.29
Married	78.8	69.8			
others	21.2	30.2			
Job status			1.23	1	.27
Retired	90.4	83.0			
Part-time worker	9.6	17.0			
Income group			4.96	2	.08
<$6000	34.6	47.2			
$6000-$14999	26.9	34.0			
>$14999	38.5	18.9			

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

Table 5-8 Chi-square tests across categorical socio-demographic variables across groups

Activity types	Frequency (%)					
	Never	Seldom	Sometimes	Often	Usually	Always
Physical meetings	0.0	1.9	11.5	25.0	51.9	9.6
Contacting others through technology	0.0	0.0	0.0	1.9	51.9	46.2
Physical activities	0.0	7.7	5.8	28.8	32.7	25.0
Cultural activities	1.9	13.5	21.2	40.4	13.5	9.6
Recreational activities	1.9	11.5	17.3	44.2	17.3	7.7
Religious activities	26.9	28.8	11.5	11.5	15.4	5.8
Caregiving	15.4	17.3	19.2	19.2	19.2	9.6
Voluntary work	17.3	15.4	23.1	17.3	25.0	1.9
Social organizational activities	26.9	25.0	26.9	13.5	5.8	1.9
Political activities	34.6	30.8	11.5	17.3	3.8	1.9

Note. The composite percentage may not be 100% due to rounding off issue

Table 5-9 Descriptive analysis of nine social activity types of control group (n = 52)

Activity types	Frequency (%)					
	Never	Seldom	Sometimes	Often	Usually	Always
Physical meetings	0.0	5.7	3.8	34.0	45.3	11.3
Contacting others through technology	0.0	0.0	3.8	3.8	50.9	41.5
Physical activities	1.9	11.3	7.5	26.4	39.6	13.2
Cultural activities	5.7	22.6	11.3	41.5	15.1	3.8
Recreational activities	0.0	7.5	26.4	39.6	24.5	1.9
Religious activities	43.4	26.4	11.3	7.5	11.3	0.0
Caregiving	13.2	15.1	20.8	22.6	20.8	7.5
Voluntary work	20.8	15.1	18.9	15.1	26.4	3.8
Social organizational activities	35.8	30.2	13.2	5.7	15.1	0.0
Political activities	45.3	26.4	7.5	15.1	5.7	0.0

Note. The composite percentage may not be 100% due to rounding off issue

Table 5-10 Descriptive analysis of nine social activity types of experimental group (n = 53)

Activity types	Contacting others through technology	Physical activities	Cultural activities	Recreational activities	Religious activities	Caregiving	Voluntary work	Social organizational activities	Political activities
Physical	.32**	.14	.40**	.39**	.09	.27**	.42**	.29*	.25**
Contacting others through technology		.13	.15	.19	.05	.05	.12	.10	.20*
Physical			.26**	.10	.03	-.03	.11	.10	.08
Cultural				.52**	.11	.17	.47**	.28**	.12
Recreational					.03	.23*	.29**	.13	.22*
Religious						.20*	.26**	.26**	.20*
Caregiving							.43**	.25**	.16
Voluntary								.48**	.24*
Social organizational activities									.27**

Note. *p <.05, ** p <.01 (2-tailed)

Table 5-11 Correlations between ten social activity types (n = 105)

Variables	Control Group (n = 52) Mean (*SD*)	Experimental group (n = 53) Mean (*SD*)	*t*	*df*	*p*
Physical meetings	3.56 (.90)	3.53 (.95)	.16	103	.87
Contacting others through technology	4.44 (.54)	4.30 (.72)	1.23	103	.26
Physical activities	3.62 (1.56)	3.30 (1.25)	1.33	103	.19
Cultural activities	2.79 (1.19)	2.49 (1.27)	1.24	103	.22
Recreational activities	2.87 (1.14)	2.87 (.94)	-.01	103	.99
Religious activities	1.77 (1.62)	1.17 (1.37)	2.05	103	.04*
Caregiving	2.38 (1.59)	2.45 (1.50)	-.23	103	.82
Voluntary work	2.23 (1.48)	2.23 (1.59)	.02	103	.99
Social organizational activities	1.52 (1.29)	1.34 (1.41)	.68	103	.50
Political activities	1.31 (1.32)	1.09 (1.29)	.84	103	.40
Average social participation	2.65 (.64)	2.48 (.70)	1.31	103	.19

Note. *p <.05, ** p <.01 (2-tailed)

Table 5-12 Independent samples t-tests between social activity types across experimental conditions

Results of priming manipulations

The individualized SOA was determined by a few practice trials, this personalized SOA might act as a critical factor in affecting the priming performance and its reaction time for hitting the targets. Referring to Table 5-13, the personalized SOA for control was 92.92 ms while that for experimental group was 103.24 ms, there was no difference found in the manipulation of personalized SOA [t (103) = -1.30, p = .198].

During the exact priming stage, there were 4 block of 40 trials in each block yielding to a total 160 trials of priming words to be appeared. As shown in Table 5-13, the percentage of the percentage of correct hits of target during priming for control group and experimental group was 98.50% and 97.66% respectively. This relatively high percentage of correct hits evidenced the participants did this reaction task seriously and it might serve as a proof of successfully priming manipulation although there was a trend showing that the control group clicked more correct hits than the experimental group [t (84.01) =.191, p = .060]. The

reaction time to each stimulus based on their individualized SOA for control group was 490.10 ms whereas that for experimental group was 497.03 ms, there was no significant difference in the reaction time for hitting each priming target across groups [t (103) = -.30, p = .766].

Regarding the emotional word rating procedure after each block, it served as a manipulation check, as it is postulated that those who were negatively-primed should react to negative emotional words in a faster pace compared to the counterparts. The reaction time of 8 positive words and 8 negative words were averaged. The averaged reaction time to positive emotional words for experimental group was 996.35 ms while that for control group was 816.12 ms, ANCOVA, by controlling MoCA score, baseline reaction time in priming manipulation as well as other demographic variables, ANCOVA results suggested that experimental group responded slower in positive emotional words compared to the control group [F (1, 97) = 18.52, p <.001, ηp^2 =.16]. The averaged reaction time to negative emotional words for experimental group was 974.45 ms while that for control group was 1053.03 ms. Experimental group significantly reacted faster to negative emotional words than did the control group [F (1, 97) = 5.81, p =.018, ηp^2 =.06], indicating a possibility of activating negative age-stereotypes during the priming task.

Further analyses were conducted to investigate whether social participation would moderate the effects of priming effects by controlling the baseline reaction time and MoCA score of individuals. Table 5-14 revealed the results of moderation analyses between experimental manipulation and reaction time to emotional words by controlling covariates. Results revealed that there was a significant main effect of priming manipulation on reaction time to positive emotional words after controlling MoCA score and baseline reaction time to primes (B = 438.14, t =3.05, p =.003, CI =153.27 – 723.00). As shown in Figure 5.3, the

	Experimental group (n = 53)	Control Group (n = 52)	Statistics		
	Mean (*SD*)	Mean (*SD*)	*t*	*df*	*p*
Individualized SOA (ms)	103.24 (41.34)	92.92 (40.21)	-1.30	103	.198
Correct hits (%) [#]	97.66 (2.78)	98.50 (1.62)	1.91	84.01	.060
Reaction time (ms)	497.03 (129.91)	490.10 (106.22)	-.30	103	.766

Note. [#] Degree of freedom is adjusted due to violation of homogeneity assumption

Table 5-13 Priming information across groups

interaction effect of priming manipulation and reaction time to positive emotional words by social participation was found to be significant (B = -109.62, t =-2.04, p =.045, CI =-216.57– -2.66), suggesting that participants in experimental condition who were relatively less socially active showed a longer reaction time in rating positive emotional words. All the regression weights were found to be non-significant in the relationship between experimental condition and reaction time to negative emotional words as well as the moderation analysis.

	Experimental group (n = 53)	Control Group (n = 52)	Statistics			
	Mean (*SD*)	Mean (*SD*)	*F*	*df*	*p*	η_p^2
Reaction time to negative emotional words (ms)	974.45 (154.94)	1053.03 (212.52)	5.81	97	.018*	.06
Reaction time to positive emotional words (ms)[#]	996.35 (258.31)	816.12 (137.76)	18.52	97	<.001***	.16

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

Table 5-14 Reaction time to emotional words during priming manipulation

Outcome: Reaction time to negative emotional words, $R^2 = .39$, MSE = 31831.49

Variables	B	SE	t	p	LLCI	ULCI
Experimental group	-48.37	136.88	-.35	.725	-320.11	223.38
Social participation	-25.78	38.62	-.67	.506	-102.45	50.89
Experimental group*Social participation	-14.27	51.39	-.28	.782	-116.30	87.76

Outcome: Reaction time to positive emotional words, $R^2 = .61$, MSE = 33664.62

Variables	B	SE	t	p	LLCI	ULCI
Experimental group	438.14	143.49	3.05	.003**	153.27	723.00
Social participation	32.34	40.48	.799	.426	-48.03	112.71
Experimental group*Social participation	-109.62	53.88	-2.04	.045*	-216.57	-2.66

Note. *p < .05, **p < .01, ***p < .001

Table 5-15 Moderation analyses of social participation between experimental manipulation and reaction time to emotional words
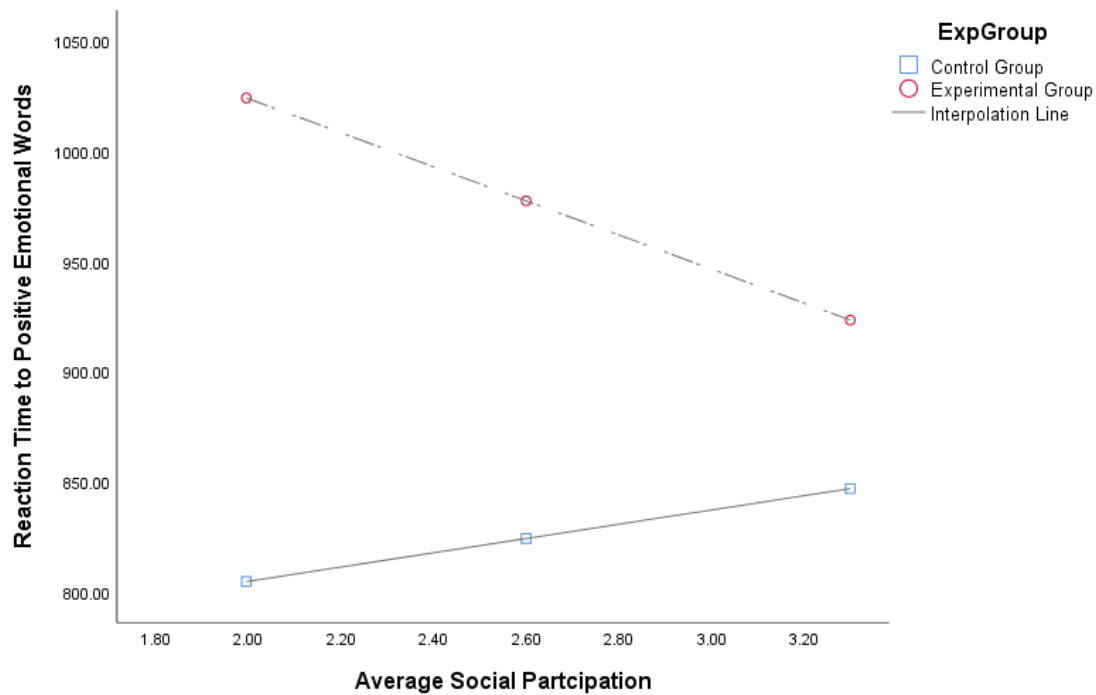

Figure 5-3 Moderation effect of social participation between experimental group and reaction time to positive emotional words

Results of performances in HKLLT

Results of learning trials

Scoring of the HKLLT was based on the manual and previous studies (Au, Chan, & Chiu, 2003). The mean scores of each learning trial and total learning scores were shown in Table 5-16. The average learning words of learning trial 1, learning trial 2 and learning trial 3 for experimental group were 6.36, 9.43 and 11.23 out of 16 words respectively whereas those for control group were 7.23, 11.04 and 12.90 respectively. After controlling baseline MoCA score and other covariates, ANCOVA results revealed that control group learnt significantly more words in two latter learning trials than the experimental group [F (1, 98) = 14.47, p <.001, ηp^2 =.13; F (1, 98) = 17.02, p <.001, ηp^2 =.15]. Since these three trial were highly correlated (.56 < r <.77) and according to the manual of scoring, the total learning score was computed as one single learning score for subsequent analyses. ANCOVA results indicated that experimental group learned significantly worse than the control group F (1, 98) = 15.01, p <.001, ηp^2 =.13].

	Experimental group (n = 53)	Control Group (n = 52)	Statistics			
	Mean (*SD*)	Mean (*SD*)	*F*	*df*	*p*	η_p^2
Learning trial 1^	6.36 (1.77)	7.23 (1.91)	3.44	98	.07	.03
Learning trial 2^	9.43 (1.81)	11.04 (2.14)	14.47	98	<.001***	.13
Learning trial 3^	11.23 (2.02)	12.90 (1.67)	17.02	98	<.001***	.15
Total learning #	27.02 (4.72)	31.17 (5.06)	15.01	98	<.001***	.13

Note. ^ out of 16 words, # out of 48 words
*p < .05, **p < .01, ***p < .001
Table 5-16 Learning performance in HKLLT across groups

Results of delayed recalls

Table 5-17 provided the results of delayed recall performance in HKLLT across groups. Experimental group recalled an average of about 9 words in both delayed-recall sessions while control group recalled an average of around 12 words in both sessions.

ANCOVA results indicated that control group performed statistically better than the experimental group in 10-minute delayed recall [F (1, 98) = 46.86, p <.001, ηp^2 =.32] and 30-minute delayed recall [F (1, 98) = 48.14, p <.001, ηp^2 =.33].

The rate of forgetting in the first 10 minute was computed by the suggested formula as [(10-minute delayed recall − learning trial 3)/learning trial 3 x 100%] (Au et al., 2003). This formula could demonstrate the percentages of words forgotten in 10-minute recall trial but successfully learnt in the learning trial 3. ANCOVA results indicated that experimental group had a significantly higher rate of forgetting [F (1, 98) = 14.66, p <.001, ηp^2 =.13].

	Experimental group (n = 53)	Control Group (n = 52)	Statistics			
	Mean (*SD*)	Mean (*SD*)	*F*	*df*	*p*	η_p^2
10-minute delayed recall^	8.81 (2.33)	11.90 (2.14)	46.86	98	<.001	.32
30-minute delayed recall^	8.79 (2.59)	12.08 (2.31)	48.14	98	<.001	.33
Rate of forgetting (%)	-20.95 (19.83)	-7.97 (9.77)	14.66	98	<.001	.13
Total intrusion errors	4.17 (2.99)	1.38 (1.57)	28.64	98	<.001	.23

Note. ^ out of 16 words

Table 5-17 Delayed recall performance in HKLLT across groups

Recalling words is one of the criteria to determine the overall performance, but recalling fewer words does not necessarily equivalent to making more errors. Hence, intrusion errors were counted when individuals reported intrusion words in both delayed recall sessions. As shown in Table 5-17, ANCOVA results revealed that experimental group did make more intrusion errors than the control group [F (1, 98) = 28.64, p <.001, ηp^2 =.23].

Results of recognition trial

The recognition task requires participants to indicate a list of 32 items, half of them are targets while half of them are foils, in a yes or no manner. Only considering the correct hits would lead to overwhelming effect since participants might click all 'yes' for the list of

32 words leading to 100% correct rate of target hits. Hence, discrimination score was calculated as it considers both correct hits and false alarm errors with the formula [(Correct hits - False alarm)/16 x 100%]. A 100% score indicates all 16 target items are correctly identified as well as the other 16 distracting items are also correctly isolated. As indicated in Table 5-18, the control group did significantly better than the experimental in recognition trial, ANCOVA results supported this statement in discrimination score across groups after controlling baseline MoCA score [F (1, 98) = 14.55, p <.001, ηp^2 =.13].

	Experimental group (n = 53)	Control Group (n = 52)	Statistics			
	Mean (*SD*)	Mean (*SD*)	*F*	*df*	*p*	η_p^2
Correct hits^	14.13 (1.97)	14.85 (1.27)	2.56	98	.113	.03
False alarm^	2.02 (2.02)	.62 (.89)	15.65	98	<.001***	.14
Discrimination score (%)	77.13 (17.07)	89.18 (9.68)	14.55	98	<.001***	.13

Note. ^ out of 16 words

Table 5-18 Recognition trial performance in HKLLT across groups

Results of moderating effect of social participation in relation to experimental manipulation and memory performances

Subsequent analyses were conducted to investigate whether social participation would moderate the relationship between priming manipulation and memory performance in HKLLT after controlling the MoCA score of individuals as the covariate. Table 5-19 revealed the results of moderation analysis of social participation between experimental manipulation and total learning. Since the 10-minute and 30-minute delayed recall score were highly correlated (r = .89), I computed one composite score named as total delayed recall by adding two delayed recall score. Results of moderation analysis of social participation between experimental manipulation and total delayed recall score as well as results of moderation analysis of social participation between experimental manipulation and discrimination score were shown in Table 5-19.

Outcome: Total learning, R^2 = .40, MSE = 18.22

Variables	B	SE	t	p	LLCI	ULCI
Experimental group	-3.06	3.41	-.90	.371	-9.82	3.70
Social participation	.47	.96	.49	.626	-1.44	2.38
Experimental group*Social participation	-.08	1.28	-.06	.953	-2.62	2.47

Outcome: Total delayed recall score, R^2 = .49, MSE = 118.10

Variables	B	SE	t	p	LLCI	ULCI
Experimental group	-23.59	8.68	-2.72	.008**	-40.81	-6.37
Social participation	1.02	2.45	.42	.677	-3.84	5.89
Experimental group*Social participation	4.43	3.26	1.36	.177	-2.04	10.90

Outcome: Discrimination score, R^2 = .39, MSE = 150.87

Variables	B	SE	t	p	LLCI	ULCI
Experimental group	-29.75	9.81	-3.03	.003**	-49.22	-10.29
Social participation	2.59	2.77	.94	.352	-2.91	8.08
Experimental group*Social participation	7.83	3.68	2.13*	.036*	.52	15.14

Note. *p < .05, **p < .01, ***p < .001
Table 5-19 Moderation analyses of social participation between experimental manipulation and memory performances in HKLLT

Regarding the total learning and total delayed recall score, controlling the MoCA score as the covariate, moderation analyses revealed that social participation did not moderate the relationship between experimental condition and learning performance (*B* = -.08, *t* =-.06, *p* =.953, CI =-2.62 – 2.47) and total delayed recall score (*B* = 4.43, *t* =1.36, *p* =.177, CI =-2.04 – 10.90). Interestingly, it was found that social participation moderated the effect of experimental manipulation on discrimination score in HKLLT (*B* = 7.83, *t* =2.13, *p* =.036, CI =.52 – 15.14). As shown in Figure 5.4, participants who were primed with negative age stereotypes and who were relatively less active in social participation, did the worst in the discrimination score in HKLLT.
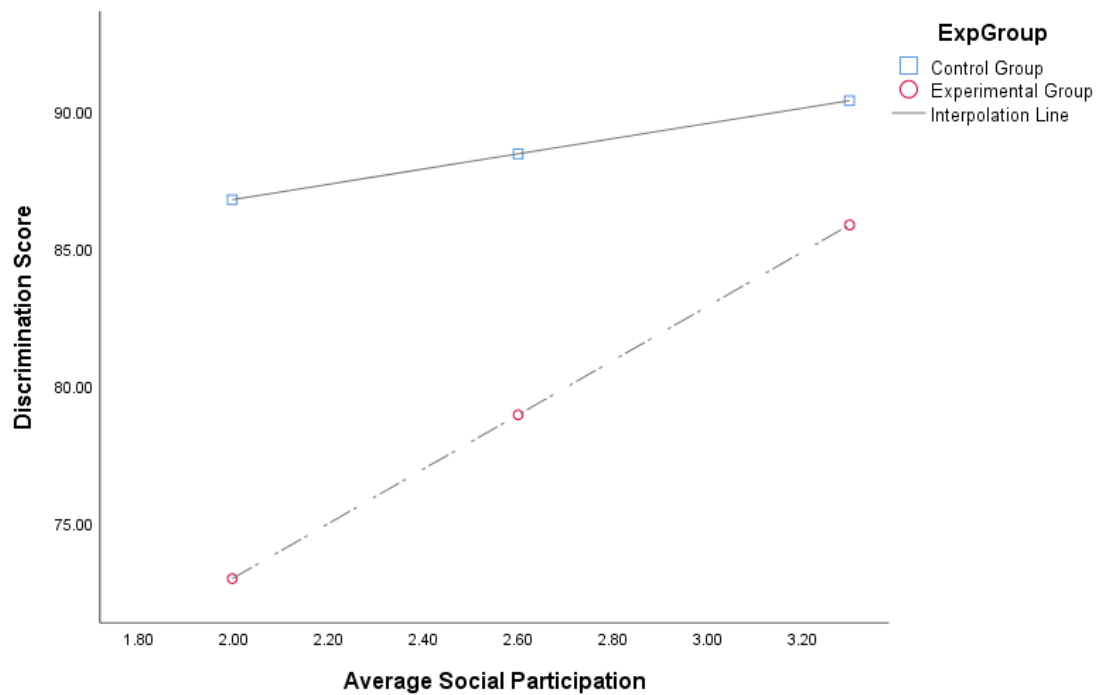
Figure 5-4 Moderation effect of social participation between experimental group and Discrimination score

Discussion

This study examined how implicitly priming negative age stereotype could induce detrimental effects on memory performance among older adults in Hong Kong and our results replicated previous studies as reviewed. Participants were primed with negative age stereotypes in experimental group and these stereotypes were assumed to be activated under subliminal level as indicated by the shorter reaction time to negative but longer reaction time to positive emotional words in experimental group.

Concerning the priming task, results indicated that those who were primed with negative age stereotypes, their reaction time to rate positive emotional words was longer and that to rate negative emotional words was shorter, the differences in reaction time somewhat proved that the experimental manipulation was successful, that was, their negative age stereotypes were activated during the process. Furthermore, socially less active participants who were primed with negative age stereotypes showed a longer reaction time in rating positive emotional words. However, for negative emotional words, there was an absence of

182

moderating effect. This could be possible that after activation of their own negative perceptions of aging, when they were asked to rate positive emotional words, those who were relatively active were assumed to possess less negative age stereotypes so that the response time to positive emotional word remained similar, but those who were less active and with more negative view of aging might need to spend cognitive resources on counteracting for reducing self-doubt or worries (Schmader, Johns, & Forbes, 2008). Moreover, it could also be argued that when negative age stereotypes were activated in the participants, the presentation of contradictory words (i.e. positive emotional words) might saliently induce self-doubt, thus reducing their availability of resources of performing reaction time tasks as well as subsequent memory tasks.

Our study also supported our hypothesis that negative age stereotypes could impact on memory performances of older adults. The present results were consistent with studies done in both Asian and Western countries (Lee & Lee, 2018). HKLLT has been taken as an essential tool in dissecting the whole process of memory task including stages of learning, recalling and recognizing. Throughout the different processes of the study, results consistently suggested that the experimental group did poorer than the control group in all stages after controlling their baseline performances and other covariates. It could be argued that priming negative age stereotypes would interfere with the working memory of participants in all stages. The availability of resources for performing the memory tasks was reduced with the result that they learned worse than their counterparts even when semantic organization was taken as an effective strategy. Furthermore, participants might have spent cognitive resources on processing the primes, ignoring and distinguishing them from the targeted word list. This process might be reflected by the three major results among experimental group on higher forgetting rate, fewer correctly recalled words as well as greater chance of making intrusion errors.

Results partially supported participants who were negatively-primed but with greater social participation would be less affected, although this effect was significant only in the relationship between priming manipulation and recognition task. It could be possible that the effects of negative age stereotype priming was too compelling after the priming manipulation, so that during the learning and recall sessions, participants might contemplate the relevancy of negative primes and compare themselves with their working self accordingly (Zhang et al., 2017). However, after a period of time (i.e. an hour after priming manipulation), the self-relevance effect faded and those who were socially active might counter-off the negative effects of negative age stereotypes and performed almost equally well as the control subjects.

Another possible interpretation is related to the nature of the memory test. The present studies showed that the magnitude of effect was stronger in delayed-recall tasks than the recognition tasks. Recall and recognition involve differential mechanisms in processing and recognition task is generally considered to be less demanding (Cabeza et al., 1997). Delayed recall process is a more self-initiated process which demands participants more cognitive efforts relative to recognition tests which rely more on situational and environmental cues. Research generally supported that both processes involved brain activation in the area of right pre-frontal cortex and the anterior cingulate, yet, compared to recall, recognition had higher activation in the right inferior parietal cortex, providing evidence that both processes involved in the two modes of episodic retrieval (Cabeza et al., 1997). The activation of negative age stereotypes might exert greater negative force on the recall task; this might explain why the moderation effects were non-significant in delayed recall tasks but became significant in recognition task that was relatively less demanding (Armstrong, Gallant, Li, Patel, & Wong, 2017).

To recap previous discussion, a large body of research indicated the positive impacts of social participation on physical and psychological well-being of aged adults, productive and

184

social activities are found to be the key variables associated with subjective and psychological well-being among older generation (Adams et al., 2010). The number of participated social activities was also found to be significantly and positively associated with mental status and memory (Pan & Chee, 2019). Another study evidenced that elderly who participate more frequently in community social activities scored lower in the Negative Ageing Stereotypes Assessment Questionnaire, researchers argued that elderly who participate less in daily life are more prone to suffering negative beliefs about social contacts, which further foster the risk of suffering health, cognitive and mental problems (Palacios, Torres, & Mena, 2009). This study might provide a possible intervention for future study that social participation might act as an effective strategy against negative age stereotypes.

Limitations of study 2

There are several limitations in the current study. First, the participants were relatively well-educated and they scored relatively high in the MoCA test. One previous study indicated negative age stereotypes could be more destructive among young-olds and participants with higher education (Hess et al., 2009). The significantly powerful effect of priming manipulation of this study could be justified. The impact on those who are older than the present group and those with relatively lower education background might need further investigation.

Secondly, although the relatively socially active aged adults were less likely to be affected in the memory test, this effect was found to be significant only in recognition task of the memory test. It is possible that socially active individuals could possess fewer negative age stereotypes. Future studies could try to explore whether there could be specific negative age stereotype primes that exert specific impacts on performance outcomes.

Thirdly, the delayed recall process is a more self-initiated process which demands more cognitive efforts relative to recognition tests which rely more on situational and environmental cues. There could be a possibility that the priming effect of negative age stereotypes may exert a greater impact on more demanding tasks which require more cognitive loads (Armstrong et al., 2017). Future studies could be done by varying cognitive demands of memory tasks in order to understand more about the impacts of negative stereotypes.

Finally, although social participation might act as a protective factor for negative age stereotypes, we did not include an experimental group with intervention for comparison. Tan and Barber (2018) have tested whether an intervention that highlighted Confucian principles would protect Chinese older adults from stereotype threat's detrimental effects. They found that stereotype threat did impair the older adults' memory performance. Yet, their intervention was effective in eliminating this deficit as participants who were reminded of the Confucian principle of filial piety. Future studies can further examine whether culturally-based interventions can alleviate the effects of negative priming.

Summary

This Chapter covered the main results of the study 2, the experimental study on effects of negative age stereotype primes on memory performances among aged adults. Most of the hypotheses were fully or partially supported. Concerning the reaction time task results of the study 2, H2.4 was rejected while H1.1, H1.3 and H1.4 were supported. Concerning the results of memory performance, H2.6 – H 2.8 and H2.10 – H2.11 were fully supported, however, H2.9 was rejected. Regarding the moderation postulates of H2.12 – H2.14, only H2.14 was supported.

Study 2 replicated and extended the investigation on how negative age stereotype priming could affect various processes of memory performance using implicit priming among older adults in Hong Kong. The frequency of social participation was also included as a moderator on this effect. The initial empirical support that social participation can be a potential buffer against negative age stereotype priming could be intriguing. That is socially-active older adults might possess few negative age stereotypes so that the vicious circle on negatively looping could be avoided. This study established that social participation of older adults not just provide positive impacts on their well-being, it could also act as a protective factor that prevent the negative effects induced by negative age stereotype primes.

Conclusion and contributions

Hong Kong is one of the cities facing the challenge of population aging, policy makers are not only responsible for satisfying demands of them but also responsible for constructing a suitable environment for them to age actively. This thesis contributed to the field that it provided a preliminary profiles of the social participation patterns in Hong Kong. It also consolidated the theoretical models in aging studies, suggesting that social support could be a more essential factor leading to better well-being among older adults. Future studies could be done on how to enhance social support through social participation as well as how to aid older adults on enlarging their social circles. More intervention programs could be promoted in both community level and society level, at the level, community centers should provide more chances for older adults to fully engage in the community, particularly on recreational, physical and voluntary activities.

This thesis also contributed to the literature by empirically studying the effects of negative age stereotypes on memory performances in Hong Kong population. The detrimental effects of priming negative age stereotypes on memory performances were supported and found to be consistent with western studies. Moreover, it also proposed an

innovative idea that social participation could moderate the priming effects. Although the results were not completely consistent, the potential positive role of social participation on buffering the effects of negative age stereotypes should not be neglected. At the societal level, promotional or educational programs should be carried out, for example, the introduction of inter-generation contacts could not only reduce stereotypical biases, but also provide opportunities for social participation for them, so that the better well-being of older adults could be thoroughly facilitated.

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Appendix A

Montreal Cognitive Assessment Hong Kong Version (HK-MoCA)

蒙特利爾認知評估香港版

使用及計分指引

蒙特利爾認知評估香港版是一個用來快速篩選輕度認知障礙人士的量表。它量度不同的
認知領域：專注力與集中力、執行功能、記憶力、語言能力、視覺構建技巧、思想概念、
計算與定位。完成整個量表的時間約為十分鐘。總分為三十分。取得二十二分或以上為
之正常。

1. 交替轉換測試：

　　使用指引：測試者指示受測者：「請畫一條線，順序由一個數字到另一個數字，但
背景顏色必須與之前一個數字的背景顏色不同。由此處【指向①】開始，畫一條線由①
之後到❷，然後到③，如此類推。最後在此處【指向⓮】完成。」

　　計分：如受測者能根據以下次序順利畫出：①—❷—③—❹—⑤—❻—⑦—❽—⑨
—⓮，而線與線之間沒有重疊，可得1分。任何錯處沒有即時更正，則得0分。

2. 視覺構建技巧 (立方體)：

　　使用指引：測試者給予以下指示，並同時指著立方體：「模仿這個圖形在以下位置
畫它出來，越準確越好。」

　　計分：能夠順利畫出圖案，可得1分。
   - 畫出來的圖案必須為立體
   - 所有線必須畫出
   - 沒有加上額外的線
   - 線與線之間相對地較平衡，它們的長度應近似（直角棱鏡可以接受）
   如不符合以上任何一個要求，則得0分。

3. 視覺構建技巧 (時鐘)：

　　使用指引：測試者指著右邊空白位置並給予以下指示：「畫一個時鐘。填上所有數
字並將時間調較為十一時十分。」

　　計分：以下三項，每符合一項得1分：
   - 輪廓（1分）：鐘面必須為一圓形，只接納輕微的歪曲（例如：在圓形的接
     合點有些微不美觀之處）。
   - 數字（1分）：所有在時鐘上的數字必須寫上，同時沒有任何附加的數字；
     數字必須順序及正確地寫於鐘面的適當位置上。羅馬數字亦可接受。數字
     可寫於時鐘界線之外。

- 時分針（1分）：時針與分針必須同時指出正確的時間；時針必須明顯地比分針短；時分針必須置於鐘面的中央位置；它們的接合點需要接近時鐘的中心。

以上如沒有一項符合要求，給0分。

4. 名稱：

使用指引： 由左邊開始，指著每一個圖案說出：「講出這隻動物的名字。」

計分： 以下每一個回應可得1分：（1）駱駝或單峰駝、（2）獅子、（3）犀牛。

5. 記憶：

使用指引： 測試者用每一秒一詞的速度讀出一共五個詞語，並給予以下指示：「這是一個記憶力測試。我將會讀出一些詞語，請你現在把它們聽清楚及記住。當我讀完這些詞語的時候，盡量說給我聽你能夠記得的，次序並不重要。」在預留的位置上記下受測者在第一次嘗試中講出的每一個詞語。當受測者示意他完成（已講出所有的詞語），或不能再講出任何的詞語時，測試者將那些詞語重讀一次並給予以下指示：「我會將之前那些詞語重複讀第二次。請嘗試把它們記住並說給我聽，越多越好，包括之前你提及的那些。」在預留的位置上記下受測者在第二次測試中講出的每個詞語。在第二次測試完結時，告訴受測者他將會被再次問及那些詞語：「我會在整個測試完結時再問你那些詞語。」

計分： 第一及第二次測試均不計分。

6. 專注力：

數字順背：使用指引： 給予以下指示：「我將會讀一些數字，當我讀完之後，你便根據我所說的重複一次說出來。」用每秒一個數字的速度讀出有五個數字的數列。

數字倒背：使用指引： 給予以下指示：「現在我將會讀出另一些數字，但這次當我讀完之後，你要把它們倒轉講給我聽。」用每秒一個數字的速度讀出有三個數字的數列。

計分： 每一個正確地重複的數列，給1分（註：數字倒背的正確回應是2－4－7）。

警惕性：使用指引： 測試者用每秒一個的速度讀出一列的數字，並給予以下指示：「我將會讀出一列的數字。每次當我讀出 "1" 這個數字時，請你敲打桌面一次。如果我讀出其他數字時則毋需敲打桌面。」

計分： 沒有或只有一個錯處，給1分（錯處是指在讀出其他數字時敲打桌面或在讀出 "1" 時沒有敲打桌面。）

連減（7s）：使用指引：　測試者給予以下指示：「現在我想你用一百減七，之後再減七，一直減下去，直到我叫停為止。」如有需要，可重複指示一次。

計分：　這項測試共有3分。如沒有一個正確的答案，給0分。有一個正確答案，給1分。有兩個或三個正確答案，給2分。有四個或五個正確答案，給3分。每個　正確答案由100減7開始。每個減項獨立計算；意即如受測者答錯一個答案，但用該答案再減7而正確的話，即作為一個正確答案。例如：有一個受測者的回應為 "92 - 85 - 78 - 71 - 64"，當中92這個答案不正確，但之後所有答案均正確無誤。這則視為一個錯誤，可得3分。

7. 重複句子：
　　使用指引：　測試者給予以下指示：「我將會讀一句句子給你聽。我讀完之後請你重複，要與我之前所說的一模一樣〔停頓〕："姨丈買魚腸"。」回應之後，說：「我現在會讀出另一句，讀完之後請你重複讀出一模一樣的〔停頓〕："西施四十四歲"。」

　　計分：　每一句正確回應的句子，給1分。受測者重複那句句子必須一模一樣。

8. 語言流暢度
　　使用指引：　測試者給予以下指引：「你現在有一分鐘時間，我想你講一些名稱給我聽，越多越好。例如我要你講一些花朵的名稱時，你可以說："向日葵、菊花……" 準備好嗎？〔停頓〕現在，你有一分鐘的時間，我想你盡量說出你記得的動物。〔時間60秒〕。停！」

　　計分：　如受測者能在60秒時間內講出十一個或以上的詞語，給1分。記下受測者的答案於頁底或頁邊。

9. 抽象概念
　　使用指引：　測試者要求受測者解釋每對字詞的相似之處，由例題開始：「講出橙與香蕉相似的地方。」如受測者回答得較為具體，測試者再說一次：「從另一方面來說，請講出那些東西在哪一方面是近似的。」如受測者不能給予適當的回應（生果），如：「它們都是生果。」，則不用再提供任何指示或闡明。
　　在練習完畢後，說：「現在，講給我知為何火車與單車是相類似的。」回應後，測試者開始第二次測試，說：「現在講出間尺與手錶相似的地方。」不要給予任何指引與提示。

　　計分：　只有最後兩對組合需要計分。每個對於物件組合的答案正確，給1分。以下的答案也可接受：
　　火車－單車 = 用作交通運輸，旅遊出外的工具；

間尺－手錶 = 用作量度的工具，用來量度東西；
以下答案不被接納：火車－單車 = 它們有車輪；間尺－手錶 = 它們有數字。

10. 延遲記憶

使用指引： 測試者給予以下指示：「我之前讀了一些詞語給你聽，我叫你記住它們。現在請你講出你記得的那些詞語。」如有正確的答案（不需提示），在已提供的空白地方劃上記號（✔）。

計分： 在沒有提示的情況下，每個正確的詞語給1分。

選擇性採用：
在延遲記憶測試後，用類目提示去引導受測者回想那些未被講出的字，如受測者能在有類目提示或選擇的情況下回想那些字，則在已提供的位置上加上記號（✔）。如受測者在提供類目提示後仍未能回想那些詞語，則可提供選擇給他們，並用以下指引：「那個詞你認為是之前說過的：“鼻子”、“面孔”、還是“手”？」
每個字在適當時可用以下的類目提示和／或選擇：

面孔：	類目提示：身體的一部分	選擇題：鼻子、面孔、手
絲絨：	類目提示：紡織品的一種	選擇題：牛仔布、棉花、絲絨
教堂：	類目提示：建築物的一種	選擇題：教堂、學校、醫院
雛菊：	類目提示：花的一種	選擇題：玫瑰、雛菊、鬱金香
紅色：	類目提示：一種顏色	選擇題：紅色、藍色、綠色

計分： 在有提示的情況下回想那些字並不獲分數。提示只用作臨床資料搜集的目的。這樣能令測試分析員有額外的資料去判斷記憶障礙的類別。那些由於檢索失敗而導致的記憶障礙，我們可以用提示去改善記憶能力。至於那些由於編碼失敗而造成的記憶障礙，提示似乎不能引起任何作用。

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11. 定向：

使用指引： 測試者提供以下指示：「請講出今日的日子。」如果受測者不能提供完整的答案，則給予以下提示：「請講出 [年、月、日、及星期幾]。」之後說：「請講出你現在身處的地點和地區。」

計分： 每一項正確的回應，給1分。受測者必須說出正確的日期、地點和地區。如受測者錯誤地說出該項，給0分。

總分： 把在右邊的分數加起來。如受測者只接受過六年或以下的正式教育，加1分，但最高總分不多於30分。總分取得22分或以上為正常。