Impact of Morbidity and Life Events on Successful Aging

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Abstract

The purpose of this study was to examine the risks of the incidence of chronic conditions and life events on successful aging. Longitudinal data from a 10-year follow-up health survey were used. Successful aging indicators included basic and advanced physical function, depressive symptoms, cognitive function, emotional support, participation in productive activities, and life satisfaction. The stressors included life events and morbidity years of 10 chronic conditions. Loss of offspring increased the risk to physical health, psychological health, and life satisfaction. Being newly widowed was related to depressive symptoms, whereas being newly divorced increased the risk of poor social support. Morbidity years increased the risk of failure in successful aging, especially for stroke, respiratory system disease, diabetes, and cancer. Emotional health of the elderly should be carefully monitored after onset of life events and incidences of chronic conditions.

Keywords

chronic conditions, life events, successful aging, elderly health

Introduction

There are 2 common health risks for the elderly in their later life: chronic conditions and life events. The prevalence of chronic conditions among the elderly is high. It is necessary for old people to live with their chronic conditions when they are trying to achieve or maintain a successful aging life. According to Rowe and Kahn's definition,[1] successful aging indicates low risk of disease, high psychological and physical function, and engagement with life simultaneously. Some research used multidimensional construct to study successful aging.[2-5] However, the impact of chronic conditions and life events on multidimensional successful aging are less examined. We do not know clearly about successful aging profiles of morbidity in chronic conditions, since most studies focused on a specific health outcome. In addition, multiple life events in later life are usually negative and may have an impact on the physical or psychosocial health of the elderly, but the influence on the whole successful aging picture has not been fully depicted. Since life events and morbidity of chronic conditions are hardly avoidable in later life, their effect on successful aging needs to be explored. This study views life events and chronic conditions as stressors in later

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life and analyzes the health impact of morbidity of chronic conditions and incidence of life events on successful aging in the case of Taiwan.

From sociological explanations, the stressors have been divided into 2 categories in recent years: life events and chronic strain.[6] The relationship between life events and health was established in past research and it provided explanations for the assumption that change is potentially harmful because all change requires readjustment. Chronic strains, in sociological view, involve social roles and role sets. The consequences of the stressors on health may continue or repeat through the entire life course, and the impact is unequally distributed because of socioeconomic status.[7] Medically, stress may affect health through physiological and psychological mechanisms. In psychoneuroimmunology, it is assumed that the central nervous system and the immune system are interrelated. Hence the psychological characteristics or state will first influence the central nervous system, hormonal response, and behavioral change followed by change in immunity and disease susceptibility.[8] Stressful events, either daily or lasting, have the potential to influence the immune system.

The health outcome of chronic conditions for the elderly has been widely reported in past studies; however, the outcome was viewed from the perspective of successful aging. Stressful life events and the early-year risks such as childhood neuroticism or cognitive ability play an important role in depression.[9] Life events involving the death, suicide, or illness of a spouse, offspring, parent, or sibling may increase the risk of depression or anxiety.[10-12] Additionally, being unemployed or not having enough money to pay for basic daily expenses may also affect one's health.[11,13]

The effect of life events in causing major depression was found to be greater for women than for men.[12] The severity of a life event can also be related to the risk of depression.[14] Markedly important threatening life events in the prior year had an effect on depressive disorders, but the general moderate and mild threatening life events were nonsignificantly related.[15] Injury or illness of friends would motivate old people to become more active and consequently improve their cognitive function.[13] Lifetime trauma that was caused by the stressful life events that the elderly encountered in their lifetime was related to lower life satisfaction for the old people.[16] The effect of loss-related events on depressive symptoms was also found to grow with time.[17] The adverse life events also had an impact on quality of life.[18]

Not only physical health but also psychological outcomes are affected by chronic conditions.[19] Heart disease, chronic lung disease, and gait slowing/Parkinsonism may cause not only disability and negative self-rated health but also depressive symptoms and decrease in life satisfaction.[20] Stroke, congestive heart failure, myocardial infarction, hip fracture, and cancer may influence self-rated health and functional limitation.[10,21] It is explained that these diseases share the same risk factors such as stress or lifestyles with depressive symptoms,[22] or the disease turns out to be a life stress for the patient.[23]

The purpose of this study is to examine the impact of chronic conditions and life events on successful aging among the elderly in Taiwan. A nationwide representative longitudinal data was analyzed to depict the profiles of the impact of chronic conditions and life events on successful aging. The results are expected to have implications for the elderly as well as the younger cohorts and make them realize and adapt to the impact life events and chronic conditions have in old age.

Methods

Data and Samples

The data were from the 1993-2003 "Survey of Health and Living Status for the Elderly in Taiwan," a nationally representative survey conducted by the Bureau of Health Promotion, Department of Health. This longitudinal study began in 1989, and face-to-face interviews were conducted with

Table 1. Characteristics of the Samples at Baseline 1993

Characteristics	1993; N = 3155 (%)
Age in years; mean (SD)	71.35 (5.88)
64-69	46.8
70-74	27.2
75-79	12.1
80+	11.0
Gender	
Female	43.6
Male	56.4
Education in years; mean (SD)	4.37 (4.38)
Illiterate	40.4
Elementary school	41.0
Primary high school or more	18.6
Marital status	
Married	61.5
Divorced/separated	1.1
Widowed	6.3
Never married	31.1
Chronic conditions prevalence	
Hypertension	30.1
Diabetes	10.5
Heart disease	21.3
Stroke	6.9
Cancer	1.7
Respiratory system disease	16.1
Rheumatism/arthritis	24.5
Ulcer or stomach disease	12.0
Liver/gallbladder disease	5.7
Kidney disease	6.9

a random sample of individuals (aged 60 years or more) derived from the entire Taiwanese elderly population, including those in institutions. All the research staff and interviewers were very experienced and received standardized training to assure the consistency and validity of the survey. A 3-stage proportional-to-size probability sampling technique was used. The first stage consisted of a stratified sample of townships, the second consisted of blocks in the selected townships, and the third consisted of 2 respondents selected systematically from the register in each selected neighborhood. The data used in this study were obtained from the subsequent face-to-face interviews in 1993 (n = 3155), 1996 (n = 2669), 1999 (n = 2310), and 2003 (n = 1623). The lost cases were because of death or loss of follow-up. Sample deaths were linked and verified through official death registration records. By the goodness-of-fit test of gender and age, the death or lost follow-up cases were mostly older males. The characteristics of the participants are shown in Table 1.

Measures

Successful aging. We defined successful aging as aging healthily and positively in physical, psychological, social, and subjective well-being. Seven indicators were included as successful aging:

1. *Normal basic physical function:* The measure of activities of daily living (ADL) was used. The definition of normal ADL means no difficulties in any of the following 6 items: eating, dressing, transferring, going to the toilet, bathing, and walking indoors. Any difficulty of the ADL items lasting for more than 3 months was defined as disability.
2. *Normal advanced physical function:* Instrumental activities of daily living (IADL) were measured. The definition of normal IADL means no difficulty in any of the following items: shopping for groceries, managing money, going out alone by some means of transportation, doing heavy house work, doing light house work, and making phone calls.
3. *Good emotional health:* It indicates the emotional psychological health by definition with no depressive symptoms. This was measured by the Center for Epidemiologic Studies Depression Scale (CES-D) 10-item version, in which each item had a score from 0 to 3. The cutoff point for depressive symptoms was determined by converting the point to a score of 16 on a 20-item scale[24] and using T-transformation[25] to determine the cutoff points.
4. *Normal cognitive function:* This was measured by the Short Portable Mental Status Questionnaire (SPMSQ).[26] The score ranged from 0 to 10.
5. *Good emotional support:* Four items were used for measuring emotional social support, including how much your family/friends would listen to you, how much you felt your family/friends who cared about you, how satisfied you were with family/friends' care, and how reliable your family/friends were when you were feeling ill. If the participants rated their emotional support as good enough in 3 to 4 items, then their emotional support was defined to be good. Otherwise their emotional support was defined as poor.
6. *Engaged in productive activities:* This indicated either engaging in work (including paid job, help in a home business, farming, housekeeping, and taking care of children) or participating in social groups (community social groups, religious groups, occupational unions or associations, political groups, volunteer groups, local groups, elderly groups, or elderly college).
7. *Good life satisfaction:* Life satisfaction was measured from the Life Satisfaction Rating (LSR).[27] The 10-item life satisfaction scale was produced by rating yes/no, the score of negative descriptions was transferred and the total score was summed up. If the score was ≥5, the life satisfaction was defined as good; if the score was <5, the life satisfaction was defined as poor.

Once the person failed in the successful aging indicators during the follow-up, the person was defined as a failure in maintenance of successful aging; the recovery or fluctuation of the indicators thereafter was not considered.

Life events and morbidity of chronic conditions. Marital change, offspring loss, parent loss, and hospital admission were the life events that were included in the analysis during the follow-up. These events were selected because of their commonality in later life and availability in the longitudinal data. Marital change was measured in the past 3 or 4 years between 2 interviews, categorized as being newlywed, newly widowed, newly divorced or separated, and no marital change (never married or still married). Offspring loss (death of offspring) and parental loss (death of father, mother, father-in-law, or mother-in-law) were defined as if the event happened since the beginning of baseline. Hospital admission experiences were measured in the past year in each interview. All the events within 10 years were coded as yes or no.

Morbidity of chronic conditions was reported by the participants during 1993-2003 in each wave. Only new incidences of chronic conditions during the follow-up were analyzed as events. If participants reported that they had the specific chronic conditions either before or at baseline, their cases were censored. Ten chronic conditions were included in the analysis: hypertension, diabetes,

heart disease, stroke, cancer, respiratory system disease (such as pneumonia, bronchitis, emphysema, asthma), rheumatism/arthritis, ulcer or stomach disease, liver or gallbladder disease, and kidney disease. Morbidity years, defined as the years since the participant first reported the certain chronic conditions during follow-up, was used for analysis. When the square of morbidity years was put in the model, some square items were significant but the main effect turned out to be insignificant. Therefore, only the main effect of the morbidity years was retained. In addition, in consideration of comorbidity, the incidence of chronic conditions during the 10-year follow-up was coded as yes/no, and the correlations of chronic conditions were examined.

Controlling variables. Age, gender, and educational years were used as controlling variables. If the participants reported nonformal education but were literate, their educational years were measured as elementary school.

Analysis

Descriptive analysis and Cox regression analysis were used, and relative risks of life events and morbidity years of chronic conditions were calculated. If the participants did not meet the criteria of successful aging as defined in this study, or had been morbid from chronic conditions, the cases were then censored. The survival time until morbidity or death was still included in the analysis.

The interaction of comorbidity was considered if the correlation of 2 diseases was >0.25. The correlations among the chronic conditions were examined, and the Pearson correlation was found to be >0.25 only between hypertension and heart disease ($r = 0.345$), hypertension and stroke ($r = 0.258$), and heart disease and rheumatism/arthritis ($r = 0.267$). Orthogonal interaction of the comorbidity was applied as the interaction term and added to the Cox model. However, the interaction terms were either insignificant or very close to the criteria of significance in all the models, and the model fit of all the models was not increased significantly by adding the interaction terms. The comorbidity interaction terms were thus removed from the Cox models.

Results

Table 2 shows the newly incidence of life events in percentage and average morbidity years from 1993 to 2003. Hospital admission and offspring loss were more prevalent life events, while hypertension, rheumatism/arthritis, heart disease, ulcer/stomach disease, and respiratory system disease were the more prevalent chronic conditions. Table 3 shows the successful aging at baseline and the maintenance years of successful aging during follow-up. At baseline, 92.0% of the participants had good physical function, 49.4% had good advanced physical function, 64.8% had no depressive symptoms, 85.0% had intact cognitive function, 88.5% had good emotional support, 62.1% engaged in productive activities, and 68.1% exhibited good life satisfaction. On average, they maintained good basic physical function for 6.14 years, good advanced physical function for 4.16 years, good emotional health for 3.33 years, intact cognitive function for 5.43 years, good emotional support for 5.62 years, engaged in productive activities for 3.20 years, and kept good life satisfaction for 3.66 years. That is, the failure of successful aging indicators in the 10 years ranged from 3.86 years (disability in basic physical function) to 6.80 years (stopping participation in productive activities).

Table 4 shows the relative risks (RRs) of life events and morbidity years from chronic conditions to 7 successful aging indicators by Cox regression analysis. Data from the analysis suggest an association between hospital admission and disability of basic and advanced physical function (RR = 1.167 and 1.308, respectively), having depressive symptoms (RR = 1.203), and poor life satisfaction (RR = 1.123). Offspring loss increased the risk of failure in basic and advanced physical function (RR = 1.121 and 1.194), poor emotional health (RR = 1.139), impaired cognitive

Table 2. Incidence of Life Events and Morbidity Years of Chronic Conditions, 1993-2003

Stressors	Incidence 1993-2003 (%)	Morbidity Years Since 1993; Mean (SD) Average Years
Life events		
Hospital admission	46.6	—
Offspring loss	31.8	—
Newly widowed	19.5	—
Parent loss	14.2	—
Newly divorced	1.6	—
Newly married/remarried	1.0	—
Chronic conditions		
Hypertension	50.0	6.01 (4.11)
Rheumatism/arthritis	46.8	6.33 (4.05)
Heart disease	39.1	5.43 (4.20)
Ulcer or stomach disease	33.3	5.34 (4.16)
Respiratory system disease	32.2	4.85 (4.22)
Diabetes	20.3	3.68 (3.89)
Kidney disease	18.1	3.70 (3.85)
Stroke	15.2	3.18 (3.67)
Liver/gallbladder disease	13.6	3.49 (3.79)
Cancer	5.7	2.68 (3.32)

Table 3. Successful Aging[a] of the Samples

	Successful Aging % at Baseline	Maintenance Years of Successful Aging Since Baseline; Mean (SE)
Normal basic physical function	92.0	6.14 (0.07)
Normal advanced physical function	49.4	4.16 (0.07)
Good emotional health	64.8	3.33 (0.07)
Normal cognitive function	85.0	5.43 (0.09)
Good emotional support	88.5	5.62 (0.08)
Engaged with productive activities	62.1	3.20 (0.07)
Good life satisfaction	68.1	3.66 (0.08)

Abbreviations: ADL, activities of daily living; IADL, instrumental activities of daily living; CES-D, Center for Epidemiologic Studies Depression Scale; SPMSQ, Short Portable Mental Status Questionnaire.
[a]Successful aging definition: Normal basic physical function (no disability in ADL items), normal advanced physical function (no disabilities in IADL items), good emotional health (CES-D short form score <8), normal cognitive function (SPMSQ score ≥6), good emotional support (having support at least 3 of 4 items), engaged in productive activities (attending work or social groups), good life satisfaction (satisfied in at least 5 of 10 items).

health (RR = 1.237), and poor life satisfaction (RR = 1.162). Parental loss was not significant except for the risk of no engagement with productive activities. Regarding the change in marital status, being newly widowed influenced the incidence of depressive symptoms (RR = 1.178), and being newly divorced increased the risk of losing emotional support (RR = 1.685); however, being newly married or remarried was not significant in any model.

Morbidity years since the incidence of most chronic conditions showed the impact on the failure in the dimensions of successful aging. Among the 10 chronic conditions, strokes showed comprehensive significant effects over all the dimensions of successful aging. Every year since morbidity from stroke, the RR of failure in successful aging increased from 1.025 to

Table 4. Relative Risk of Life Events and Morbidity Years to Successful Aging, 1993-2003[a]

	ADL Disability (n = 2804)	IADL Disability (n = 2804)	Depressive Symptoms (n = 2496)	Impaired Cognitive Function (n = 1973)	Poor Emotional Support (n = 2116)	No Productive Activities (n = 2452)	Poor Life Satisfaction (n = 2151)
Age	1.042***	1.046***	1.011*	1.034***	1.018**	1.032***	1.002
Gender (male)	0.988	0.786***	0.858**	0.727***	1.222**	0.948	1.067
Education	0.984	0.955***	0.976***	0.895***	0.975**	0.992	0.960***
Life events							
Hospital admission	1.167**	1.308***	1.203***	1.027	1.036	1.066	1.123*
Offspring loss	1.121*	1.194**	1.139*	1.237**	1.093	1.002	1.162**
Parent loss	1.012	0.977	0.957	1.148	1.009	1.148*	0.976
Newly widowed	0.991	1.030	1.178**	0.969	1.078	0.943	1.058
Newly divorced	1.121	1.056	1.109	1.177	1.685*	1.204	1.215
Newly married/remarried	1.003	0.631	0.962	0.682	1.814*	1.177	1.518
Morbidity year since incidence							
Hypertension	0.999	1.013	1.008	0.997	1.009	1.000	1.009
Rheumatism/arthritis	1.017*	1.030***	1.027***	1.014	1.011	1.008	1.020**
Heart disease	1.004	1.014	1.015*	0.994	1.011	1.008	1.016*
Ulcer/stomach disease	1.010	1.002	1.028***	1.006	1.005	0.997	1.017*
Respiratory system disease	1.018*	1.022**	1.026***	1.030**	1.033***	1.001	1.028***
Diabetes	1.069***	1.036***	1.013	1.039**	1.029**	1.031***	1.008
Kidney disease	1.033**	1.011	1.021*	1.011	1.024*	1.005	1.013
Stroke	1.156***	1.103***	1.025*	1.066***	1.059***	1.045***	1.048***
Liver/gallbladder disease	1.015	0.998	1.021*	0.997	1.020	1.000	1.013
Cancer	1.143***	1.027*	1.003	1.069***	1.131***	1.034**	1.014
Full model −2 LL	25259.973	29250.118	28916.705	15083.550	18505.348	28545.399	23948.392
Model −2 LL	23203.422	27939.936	28393.09	14186.700	17567.533	28090.629	23508.327
Model χ^2 (df = 19)	2329.672	1388.215	522.945	970.494	1048.720	489.430	447.105

Abbreviations: ADL, activities of daily living; IADL, instrumental activities of daily living; −2LL, −2 log likelihood.

[a]Cox regression analysis was applied. The reference groups of the categorical variables were as follows: gender (female), marital change (no marital change), offspring loss (no), parent loss (no), hospital admission (no). Age, educational years, and morbidity years were put into the model as continuous variables. *$P < .05$, **$P < .01$, ***$P < .001$.

1.156. Morbidity from diabetes, cancer, or respiratory system disease also showed comprehensive influence on successful aging. The incidence of liver/gallbladder disease was only related to emotional health, and the incidence of hypertension did not show significant effect on any successful aging indicators.

From the perspective of successful aging, chronic conditions showed different degrees of risks. Strokes and cancer influenced basic physical function the most. For advanced physical function, stroke, diabetes, and rheumatism/arthritis had bigger impact. Morbidity from these chronic conditions was significantly related to psychological health, although the effect was mild. All the disease morbidity years except for hypertension and diabetes increased the risk of depressive symptoms. And diabetes, strokes, cancer and respiratory system disease were also related to cognitive function. The participants with respiratory system disease, diabetes, kidney disease, stroke, and cancer increased the risk of poor emotional support. Diabetes, strokes and cancer had the effect of inhibiting the participants' engagement in productive activities. Regarding subjective well-being, the elderly who had heart disease, stroke, respiratory system disease, rheumatism/arthritis, and ulcer/stomach diseases had higher risks of poor life satisfaction.

Discussion

This study viewed the impact of life events and morbidity years of chronic conditions on successful aging in the later life of the people. The elderly were able to maintain successful aging for a longer period in basic physical function and cognitive function, but were less likely to maintain success in engagement with productive activities and good emotional health. Loss of offspring increased the risk to physical health, psychological health, and life satisfaction, and being newly widowed was related to the incidence of depressive symptoms. Being newly divorced increased the risk of poor emotional support. Hospital admission was related to disability in basic and advanced physical function, depressive symptoms, and poor life satisfaction. Morbidity years of diabetes, stroke, cancer, rheumatism/arthritis, ulcers or stomach disease, and kidney disease were related to the risk of failure in one or more successful aging indicators. In particular, morbidity years of stroke, respiratory system disease, diabetes, and cancer showed comprehensive effects on successful aging.

The bereavement effect[10,12-14,16,17] is reported to influence depressive symptoms, cognitive function, and other health dimensions. In this study, the effect of offspring bereavement on successful aging was found in the risk to physical health, psychological health, and life satisfaction. However, being newly widowed was only related to depressive symptoms, and parental loss was only related to inhibition in attending productive activities. The newly widowed effect is related to the risk of depressive symptoms, which is consistent with previous findings.[10,11] This indicates the acute risk of emotional health for the widowed elderly. A recent divorce was also found to increase the risk of poor emotional social support. This could, in part, be because of the shrinking of social networks, a decrease in frequency of contacts, and a decrease in social and emotional support. In related studies, traumatic life events were related to less life satisfaction,[16] but in this study only the effect of offspring loss was studied. Participants who lost a parent might be older and thus reduced the probability of attending productive activities. However, the loss of parents did not show significant effect on successful aging as expected. The possible reason is that some of the elderly had experienced parental bereavement before follow-up and thus the effect was not included in the analysis. In addition, hospital admission is related to major health problems or life-threatening events.[12] In this study, hospital admission increases not only the risk of disability in physical function but also the risk in mental health, that is, impaired cognitive function and depressive symptoms. In particular, when the incidence of hospital admission in 10 years was high (46.6%),

the relative risk of having depressive symptoms reached 1.203 for the seriously ill Taiwanese elderly. This indicates that hospital admission has an impact not only physically but also psychologically.

Strokes, respiratory system disease, diabetes, and cancer showed 5 or more kinds of effects on the 7 successful aging indicators. It indicates that these diseases may critically influence the chance of maintaining successful aging. Strokes show a comprehensive impact on all the indicators, especially a strong effect on physical function. Respiratory system disease and diabetes also show a wide-range effect on successful aging. Although the morbidity rate of cancer was smaller than other diseases, its impact on successful aging is larger. Cancer morbidity years increased the risk of losing emotional support. It is possible that the treatment and frailty of cancer patients made their life more restricted and their social health difficult to maintain. However, social support has been found to have a mediating and moderating effect on depressive symptoms.[28-30] It is important to provide appropriate emotional support to the elderly with cancer. The effect of different kinds of cancer was unavailable for analysis because of the lack of data and case availability. Besides, the incidence of rheumatism/arthritis during 10 years was relatively high (46.8%) and the average morbidity period was 6.3 years, which means that rheumatism/arthritis may be one of the major chronic conditions for the Taiwanese elderly. Many Taiwanese elderly often assume that rheumatism/arthritis is part of normal aging, and they seem to care less about it. However, the effect of rheumatism/arthritis on successful aging, ranging from physical function, depressive symptoms, to life satisfaction, should not be ignored.

Hypertension had the highest incidence in the chronic conditions in the study, but it was not significantly related to any risk of successful aging. One possible reason is that patients with this chronic condition either usually do not show severe symptoms in daily life or the disease is kept under control by medication, thus its impact on successful aging indicators is mild. Heart disease is related to depressive symptoms in past research.[13] We also found that heart disease is related to poor life satisfaction. Liver/gallbladder disease is not significantly related to any of the indicators except for depressive symptoms. Possibly the symptoms of liver/gallbladder disease are not so obvious and the patients feel less about their impact on successful aging.

Among the 7 successful aging indicators, having depressive symptoms is the most sensitive indicator to the morbidity years, which is consistent with previous studies.[12,22] All the chronic conditions except hypertension and diabetes show their risks on depressive symptoms from the onset of morbidity and it increases every year. Disability of ADL is the second highly relevant indicator to the morbidity years. The indicators less influenced by morbidity years include attending productive activities, cognitive function, and emotional social support. These indicators may be related more to age, gender, education, or other factors than to chronic conditions. The indicators regarding the social dimensions of successful aging, emotional support, and attending productive activities usually depend on the social network and the opportunities for a social environment. Even though the elderly are morbid from chronic conditions, they may still have a chance to maintain their social dimension of successful aging.

Limitations of Study

There were some limitations to this study. First, the elderly who had failed in successful aging or who already had morbidity of chronic conditions before or at baseline were censored, that is, they were excluded from the analysis. Only the life events and incidence of chronic conditions that happened during follow-up were observed. Second, it is assumed that the possibility of recovery from chronic conditions is low, and the effect of chronic conditions on successful aging increases every year. However, some diseases, such as a mild stroke, may not show their long-term effects

on some people. The impact on successful aging of the chronic conditions was averaged for every year, so actually the impact at the onset of some diseases might be even larger. Dynamic trajectories of chronic diseases are suggested to be analyzed in the future. Third, chronic strain may be a trigger for later life events, and chronic strain and life events may result in a stressful experience, but we could not separate the effect of chronic conditions or life events in the past. Fourth, the severity of chronic conditions, some major life events and confounding factors were unavailable in the data. The buffer effect of good social support for other successful aging dimensions was found in the past.[13]

Conclusion

Life events and morbidity of chronic conditions are common stressors for the elderly in their later life. This study illustrates the impact of these stressors on different dimensions of successful aging and showed that the risk may increase over time. If the risk of failure in successful aging increases every morbid year of chronic conditions, then the maintenance of successful aging for patients with chronic conditions (as a form of secondary prevention) should be an immediate and important goal. Unfortunately, many Taiwanese elderly may think of chronic conditions or old-age life events as part of normal aging, and therefore ignore the possible impact on their quality of life, especially the psychosocial dimensions of successful aging. Hence, it would be wise for policy makers to include the concept of normal aging and the impact of chronic conditions and life events as part of a primary prevention strategy in their health education efforts. Additionally, health education efforts should not only target the elderly and their families but should also include middle-aged or younger cohorts. Although primary prevention is ideal, significant numbers of older adults are already dealing with the realities of chronic conditions and traumatic life events. Secondary prevention is also important for significant proportions of the population. Furthermore, chronic conditions and traumatic life events seem to significantly affect the incidence of depressive symptoms in the elderly. Primary care physicians may have particularly important role in monitoring the emotional health of the elderly who have chronic conditions and who have recently experienced traumatic life events. In closing, future research should consider the direct and indirect effects of the stressors among the successful aging indicators. Only then the mechanism of how life events and chronic conditions influence the change of successful aging could be better understood.

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References

1. Rowe JW, Kahn RL. The structure of successful ageing. In: Rowe JW, Kahn RL, eds. *Successful Ageing*. New York, NY: Dell; 1997:36-52.
2. Chou KL, Chi I. Successful ageing among the young-old, old-old, and oldest-old Chinese. *Int J Ageing Hum Dev*. 2002;54:1-14.
3. Garfein AJ, Herzog R. Robust ageing among the young-old, old-old, and oldest-old. *J Gerontol B Psychol Sci Soc Sci*. 1995;50B:S77-S87.
4. von Faber M, van der Wiel AB, van Exel E, et al. Successful ageing in the oldest old: who can be characterized as successfully aged? *Arch Intern Med*. 2001;161:2694-2700.
5. Hsu HC. Exploring elderly people's perspective on successful aging in Taiwan. *Ageing Soc*. 2007;27:87-102.
6. Pearlin LI, Lieberman MA, Menaghan EG, Mullan JT. The stress process. *J Health Soc Behav*. 1981;22:337-356.
7. Pearlin LI, Schieman S, Fazio EM, Meersman SC. Stress, health, and the life course: some conceptual perspectives. *J Health Soc Behav*. 2005;46:205-219.
8. Cohen S, Herbert TB. Health psychology: psychological factors and physical disease from the perspective of human psychoneuroimmunology. *Annu Rev Psychol*. 1996;47:113-142.
9. Van Os J, Jones PB. Early risk factors and adult person-environment relationship in affective disorder. *Psychol Med*. 1999;29:1055-1067.
10. De Beurs E, Beekman A, Geerlings S, Deeg D, van Dyck R, van Tilburg W. On becoming depressed or anxious in later life: similar vulnerability factors but different effects of stressful life events. *Br J Psychiatry*. 2001;179:426-431.
11. Kessing LV, Agerbo E, Mortensen PB. Does the impact of major stressful life events on the risk of developing depression change throughout life? *Psychol Med*. 2003;33:1177-1184.
12. Maciejewski PK, Prigerson HG., Mazure CM. Sex differences in event-related risk for major depression. *Psychol Med*. 2001;31:593-604.
13. Rosnick CB, Small BJ, McEvoy CL, Borenstein AR, Mortimer JA. Negative life events and cognitive performance in a population of older adults. *J Aging Health*. 2007;19:612-629.
14. Brilman EI, Ormel J. Life events, difficulties and onset of depressive episode in later life. *Psychol Med*. 2001;31:859-869.
15. Chong MY, Chen CC, Tsang HY, et al. Community study of depression in old age in Taiwan: Prevalence, life events and socio-demographic correlates. *Br J Psychiatry*. 2001;178:29-35.
16. Krause N. Lifetime trauma, emotional support, and life satisfaction among older adults. *Gerontologist*. 2004;44:615-623.
17. Lynch SM, George LK. Interlocking trajectories of loss-related events and depressive symptoms among elders. *J Gerontol B Psychol Sci Soc Sci*. 2002;57B:S117-S125.
18. Tan HZ. The effect of a disastrous flood on the quality of life in Dongting Lake area. *Asia Pac J Public Health*. 2004;16:126-132.
19. Sherina MS, Rampal L, Mustaqim A. Factors associated with chronic illness among the elderly in an rural community in Malaysia. *Asia Pac J Public Health*. 2004;16:109-114.
20. Broe GA, Jorm AF, Creasey H, et al. Impact of chronic systemic and neurological disorders on disability, depression and life satisfaction. *Int J Geriatr Psychiatry*. 1998;13:667-673.
21. Diehr P, Williamson J, Patrick DL, Bild DE, Burke GL. Patterns of self-rated health in older adults before and after sentinel health events. *J Am Soc Geriatr*. 2001;49:36-44.
22. Reiff M, Schwartz S, Northridge M. Relationship of depressive symptoms to hypertension in a household survey in Harlem. *Psychosom Med*. 2001;63:711-721.
23. Clark AM. 'It's like an explosion in your life . . .': lay perspectives on stress and myocardial infarction. *J Clin Nurs*. 2003;12:544-553.
24. Radloff LS. The CES-D scale: a self-reported depression scale for research in the general population. *App Psychol Meas*. 1977;1:385-401.

25. Kohout FJ, Berkman L, Evans DA, Huntley JC. Two shorter forms of the CES-D Depression Symptom Index. *J Ageing Health*. 1993;5:179-193.
26. Pfeiffer E. A short portable mental status questionnaire for the assessment of organic brain deficit in elderly patients. *J Am Geriatr Soc*. 1975;23:433-441.
27. Neugarten BI, Havighurst RJ, Tobin SS. The measurement of life satisfaction. *J Gerontol*. 1961;16:134-143.
28. Harris T, Cook DG, Victor C, et al. (2003). Predictors of depressive symptoms in older people: a survey of two general practice populations. *Age Aging*. 2003;32:510-518.
29. Newsom JT, Schul R. Social support as a mediator in the relation between functional status and quality of life in older adults. *Psychol Aging*. 1996;11:34-44.
30. Prince MJ, Harwood RH, Blizard RA, Thomas A, Mann AH. A prospective population-based cohort study of the effects of disablement and social milieu on the onset and maintenance of later-life depression: The Tospel Oak Poject VI. *Psychol Med*. 1998;28:337-350.