FACTORS INFLUENCING OSTEOPOROSIS PREVENTIVE BEHAVIOR AMONG HAKKA

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ABSTRACT

There are about 4000 new hip fracture patients in Taiwan each year, and osteoporosis is the number one cause for these fractures. But, there has been no research article related to osteoporosis preventive behavior among Hakka living in countryside in Taiwan. Therefore, the purposes of this study were to assess osteoporosis preventive behavior; to measure the relationship among factors influencing OPB; to measure a model of factors influencing OPB; and to predict the direct and indirect effects of personal and social factors on OPB among Hakka living in Taichung County in Taiwan.

The development of a theoretical model of factors influencing osteoporosis preventive behavior was based on the Social Cognitive Theory (Bandura, 1986, 1997 , 2004) and the conceptual framework for addressing the social context of health behavior (Sorensen et al., 2003). According to the reviewed literature, the factors influencing osteoporosis preventive behavior include personal factors (age, educational level, self-efficacy for calcium intake, self-efficacy for exercise, and knowledge of osteoporosis); and social factors (social support and social capital). The outcome variables are calcium intake and exercise.

This was a non-experimental, cross-sectional design. Convenience and snowball sampling were used in this study. In all, 243 participants were recruited. Path analysis was used to assess and modify the theoretical model and to test all the paths between exogenous variables and endogenous variables. The goodness-of-fit indicators of the final model showed that X^2 was 26.99 with 21 degrees of freedom; the P-value for this model was .17; goodness-of-fit index (GFI) was .98; adjusted goodness-of-fit index (AGFI)

was .95; normed fit index (NFI) was .96; non-normed fit index (NNFI) was .98; and comparative fit index (CFI) was .99. The results suggested that the final model fit the data well.

The final model demonstrated that the personal factors and environmental factors directly and indirectly influenced osteoporosis preventive behavior. It may provide guidance for the design of future nursing interventions, research and education related to osteoporosis prevention.

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CHAPTER 1

INTRODUCTION

Osteoporosis is recognized as an increasing public health concern because of its serious consequences such as fractures and mortalities. The prevalence of osteoporosis increases with age. The incidence of osteoporosis increases from 1.13% in the 21- 30 age group to 54.55% in those aged 80 and above in the Taiwanese population (both men and women) (Lin, Chen, Chang, & Ho, 2001). The decrease in bone mineral density (BMD) in the late 40s has been found to be insignificant in pre-menopausal women (Yao et al., 2001). However, Taiwanese women's bone mineral density (BMD) decreases remarkably after age 40 (Shaw, 1993). Consequently, osteoporosis is a major health problem. People with osteoporosis are at greater risk of suffering from the array of consequences that characterize osteoporosis than those who do not have osteoporosis (Raab, Gregerson, Shaw, & Snow, 1999).

Due to economic growth and improvements in medical service and public sanitation, aging of the population is an irreversible trend in Taiwan. According to the United Nations' definition of aging, one becomes a senior upon reaching 65. An area or country is considered an aging society if the ratio of senior population to the general population exceeds 7%. Demographic data compiled by the Taiwan Ministry of the Interior show that in 1997 8% of the Taiwanese population was senior citizens and the average life expectancy for males was 72 and for females was 78. In 2002 the senior population made up 9.1% of the entire population and the average life expectancy for males was 73 and for females 78.9 (*Population statistical data*, 2002). As Taiwan's

population ages, a substantial increase of chronic diseases such as osteoporosis in seniors can be expected in the future (Lan, 2003).

To help people of all ages to increase their life expectancy and to improve their quality of life and well-being are nurses' most important responsibilities. Health-related quality of life reflects a person's sense of physical and mental health and the ability to react to factors in the physical and social environments (*Healthy people*, 2000). However, individuals with osteoporosis are at a higher risk of developing problems with physical infirmity and of facing difficulties in their daily lives, and may suffer from reduced quality of life due to restricted entertainment and free time (Kotz, Deleger, Cohen, Kamigaki, & Kurata, 2004). U.S. women with osteoporosis have significantly higher levels of depressive symptoms and a corresponding higher prevalence of depression than women without osteoporosis (Coelho, Silva, Maia, Prata, & Barros, 1999). Thus it can be seen that osteoporosis is one of the factors that can reduce people's quality of life.

Background and Significance

The age for occurrence of osteoporosis in Chinese women is about 5-15 years earlier than that in either Japanese or Caucasian women (Wu, Liao, Huang, Dai, & Zhang, 2003). It results in increased risk of fracture among the elderly population (Bellantoni, 1996) and becomes a major epidemiologic problem. According to statistics, there are about 4000 new hip fracture patients in Taiwan each year, and osteoporosis is the number one cause for these fractures. In 1993, the estimated total economic loss resulting from hip fractures, including direct and indirect medical and social costs, was 120 million US dollars in Taiwan. The estimated one year mortality rate after a hip fracture for the elderly

was 30%, which was much higher than that in the general population (Tsai, 2000).

Prevention is a cost-effective means of managing osteoporosis (Orces, Casas, Lee, Garci-Cavazos, & White, 2003) and can reduce morbidity and economic cost caused by osteoporosis. If preventive strategies of osteoporosis are not carried out, the burden on family and society will increase. The most significant responsibility of public health nurses is to promote health and prevent disease in the community. Hence, in order to perform community health nursing, nurses should understand what factors will affect residents' intention of pursuing health. After nurses recognize these factors, they can utilize nursing knowledge and techniques to empower people's desire of seeking health and adopting osteoporosis preventive behavior.

The ratio of elderly population to the general population is very high in Taiwan's countryside. Take a Hakka village, Dongshih Township in Taichung County, for example: elderly people make up as much as 13.5% of general population (7555/56127) and the Aging Index was 58.6 in 1996 (*Population of Taichung County*, 2005). The Department of Health in Taiwan has included health promotion as one of the country's health policies since 1998. In particular, much attention has focused on the reduction of osteoporosis prevalence and prevention of osteoporosis. Nonetheless, a search of the Chinese Periodical Literature, Pubmed, and Cinahl databases reveals that no research articles related to osteoporosis preventive behaviors among Hakka living in the countryside in Taiwan.

Ethnic culture can not be ignored. From a cultural perspective, different ethnic groups may have different thinking, decisions, and behavior (Leininger, 1985). However,

previous studies related to health behaviors or disease preventing behaviors have rarely explored health promotion behavior in different ethnic groups. Wang (1999) provided three possible explanations for this situation. First, researchers may not consider ethnicity to be an important factor in influencing individuals' behaviors. Second, research subjects may seem to be the acculturated to mainstream societies. These misperceptions may result in negligence regarding ethnicity issues. Third, researchers may encounter language barriers in collecting data (Wang, 1999). Even though Wang brought out these explanations, empirical studies indicate that different ethnic groups have different health care behavior (Katapodi, Facione, Miaskowski, Dodd, & Waters, 2002; Locher et al., 2005; Wang, 1999). Therefore, researchers need to take ethnicity into consideration when doing studies related to health behavior.

The Hakka are a minority ethnic group in Taiwan. Hakka people have their own Hakka dialect, dietary customs, and cultural values. Dietary factors play an important role in the determination of an individual's health. Hakka people still maintain traditional dietary habits such as salty food, rich vegetables and fruits and the excessive use of soybeans, which have ostensibly the benefit of preventing osteoporosis (Liu & Li, 2000). However, studies related to Hakka people's health issues are very rare. In light of this, a greater understanding of Hakka people's osteoporosis preventive behaviors and factors influencing their osteoporosis preventive behaviors (OPB) could be a valuable focus for research.

Purposes

This study was designed to assess osteoporosis preventive behaviors (OPB); to measure the relationship among factors influencing OPB; to measure a model of factors influencing OPB; and to predict the direct and indirect effects of personal and social factors on OPB among Hakka living in Taichung County in Taiwan.

CHAPTER 2

REVIEW OF THE LITERATURE

Osteoporosis

Definition and Classification

Bone is a specialized connective tissue that provides mechanical support for the body, facilitating muscle action and locomotion, and protecting the vital inner organs (Flynn, 2003). There are two different types of bone: cortical (compact) bone and cancellous (trabecular) bone. In human subjects, bone mass increases during childhood and adolescence, and from birth until the age of about 20.

Osteoporosis is a silent disease which is a condition of low bone mass resulting from an excess of bone consumption over bone formation and is defined as a skeletal disorder characterized by compromised bone strength predisposing to an increased risk of fracture (Lappe, 2001). It can be characterized as primary or secondary. Primary osteoporosis includes two types: Type I is post-menopausal osteoporosis and Type II is age-associated osteoporosis. Type I has an unknown etiology, but estrogen deficiency is implicated. It is associated with bone mass loss of 3% to 5% per year in the first 5 to 10 postmenopausal years. Type II is associated with calcium and vitamin D deficiency after age 70 (Goss, 1998). Secondary osteoporosis is caused by other disorders or medical treatments, such as hyperparathyroidism, glucocorticoid use, and Crohn's disease (Lappe, 2001).

Diagnosis

The diagnosis of osteoporosis is not well defined, and it is not as clear-cut as that

of cardiac disease. There is no method of determining the actual structure of bones without actually removing a piece during a biopsy (which is not practical or necessary). Current diagnostic instruments, such as dual-energy X-ray absorptiometry (DEXA) or ultrasound, can give measurement of the amount of bone (not their actual quality). This measurement is termed "bone mineral density" (BMD).

The World Health Organization (WHO) defines osteoporosis based on bone mineral density (BMD) measured by dual-energy X-ray absorptiometry (DEXA) (Hagenfeldt et al., 2003). Thus osteoporosis is defined as a bone density T-score at or below 2.5 standard deviations (T-score) below normal peak values for young adults. Established or severe osteoporosis is existent when there is at least one or more fragility fracture in conjunction with a T-score $\leq$ -2.5. Osteopenia refers to T scores between –1.0 and –2.5. There is normal bone density if the T-score is greater than –1. These criteria were initially established for the assessment of osteoporosis in Caucasian women. The Central Healthcare Bureau (CHB) in Taiwan, the sole insurance company, reimburses the cost for hormone replacement therapy (HRT) and for calcium preparations if DEXA measurements show that the T-score is at or below -2.5 (Chen, 2002).

Osteoporosis Preventive Behaviors

Three types of health prevention have been described (Minkler, 1997). Primary prevention provides specific protection against a disease to prevent its occurrence; secondary prevention consists of organized, direct screening efforts or education of the public to assist early case finding of individuals with disease so that intervention can be

instituted to halt pathologic processes and limit disability; tertiary prevention is directed toward minimizing residual disability from disease and helping the client learn to live with limitations (Pender, Murdaugh, & Parsons, 2002). The discussion of osteoporosis preventive behaviors in this study focuses on primary prevention.

Strategies for preventing osteoporosis include pharmacologic options such as hormone replacement therapy (HRT) and bisphosphonates (Fosamax, Actonel) and non-pharmacologic options such as calcium, vitamin D intake and weight-bearing exercise. However, whether the use of pharmacologic options should be the first line for prevention osteoporosis is still a controversial issue. For example, the Women's Health Initiative (WHI) randomized trials of more than 17000 healthy women. Based on the first 3 years of the Estrogen Plus Progestin Study (16608 post-menopausal women), researchers reported that estrogen and estrogen plus progestin were associated with increased risk of heart attacks, blood clots and strokes compared to placebo. Study participants were updated about these findings and encouraged to continue in the trial. Final results were not expected before 2005, but the trial was stopped on July 9, 2002 due to increased risks of invasive breast cancer, coronary heart disease, stroke and pulmonary embolism in women taking medication compared to taking placebo (Women's Health Initiative, 2002).

Using pharmacologic options to prevent osteoporosis awaits further research. Therefore, in this study osteoporosis preventive behaviors were focused only on primary preventive behaviors including calcium intake and exercise.

Calcium Intake

Bone acts as a metabolic reservoir of calcium for the maintenance of extra-cellular homeostasis. Calcium accumulates in the skeleton at an average rate of 150 mg/d, and is one of the primary bone-forming minerals. Therefore, adequate calcium intake is critical to achieving optimal peak bone mass and reducing the rate of bone loss associated with aging (Flynn, 2003).

The best sources of calcium are foods, fortified foods, and supplements. Several studies have suggested that food calcium sources are more effective than calcium supplements, not because food calcium is absorbed better, but because of the other nutrients the foods contain (Dowd, 2001). Calcium rich foods include dairy products (milk, yogurt, and hard cheese), greens of the genus Brassica (kale, collards, bok choy, and broccoli), tofu, and nuts. High dietary calcium intake may positively interact on bone mineral mass accrual (Babaroutsi, Magkos, Manios, & Sidossis, 2005; Chevalley, Rizzoli, Hans, Ferrari, & Bonjour, 2005; McCabe et al., 2004). Adult men with calcium intake above 800mg/day had significantly higher bone mass than those consuming less calcium ($p<.05$) (Babaroutsi et al., 2005).

Exercise

There are many different kinds of exercises. Weight bearing exercises are considered able to increase bone mass density and to prevent osteoporosis. Weight-bearing exercises are the kinds you do on your feet that work your bones and muscles against gravity. These kinds of exercises include weight-lifting, jogging, hiking, stair-climbing, step aerobics, dancing, racquet sports, and other activities that require muscles

to work against gravity. Ay and Yurtkuran's (2005) study showed that weight-bearing exercise can increase calcaneal broadband ultrasound attenuation (BUA)($p<.05$) (Ay & Yurtkuran, 2005). Babaroutsi's et al. (2005) study also showed that adult men devoting at least some time to physical activities had significantly higher bone mass measured by quantitative ultrasound than non-exercising peers ($p<.05$) (Babaroutsi et al., 2005).

Factors Influencing Osteoporosis Preventive Behaviors

There are many factors influencing osteoporosis preventive behaviors. According to the literature review, these factors include age, years of education, self-efficacy (calcium intake and exercise), knowledge of osteoporosis, social support, and social capital. These factors are further discussed as follows.

Age

Age is a significant predictor of osteoporosis preventive behavior in several studies (Hsieh, Novielli, Diamond, & Cheruva, 2001; Pullen, Walker, & Fiandt, 2001; Wang, 2001; Werner, Olchovsky, Erlich-Gelaki, & Vered, 2003). A survey of a convenience sample of 60 women aged from 40 to 95 in an urban family practice center and an associated retirement community found that older women were more likely to report frustration with regard to their knowledge and practices for osteoporosis prevention than younger women ($p=.02$) (Hsieh et al., 2001). In a study by Pullen, Walker and Fiandt (2001), the result indicated that age was negatively correlated with health promoting lifestyle behaviors ($r= -.34$, $p<.05$)(Pullen et al., 2001). In Wang's (2001) study, two groups of elderly women were recruited for data collection: 168 in the younger group

(mean age was 64.66) and 116 in the older group (mean age was 75.59). According to the result, age was negatively correlated with health promotion lifestyle in the older group ($r = -.458$, $p < .01$) (Wang, 2001).

Years of education

Years of education is a predictor of osteoporosis preventive behaviors. A community population-based cross-sectional study was conducted with a randomly-selected sample of 447 females aged 40 and over. The majority of subjects did not perform any activity to prevent osteoporosis. The result indicated that a senior high school education level or above was found to be a positive predictor in predicting preventive activity ($\beta = .12$, $p < .01$) (Yu & Huang, 2003).

Self-efficacy

Self-efficacy is a significant element in Bandura's Social Cognitive Theory. It is defined as an individual's beliefs regarding their general abilities to perform life activities (Ali & Twibell, 1995). Several studies indicate that self-efficacy is the most important factor predicting osteoporosis preventive behavior.

The purpose of Ali and Twibell's (1995) research was to predict the relationship between variables from the Health Promotion Model (HPM) and osteoporosis preventive behaviors (OPB) including calcium intake and exercise. The researchers applied Pender's Health Promotion model (HPM) to guide the research and to create the osteoporosis prevention model. 100 postmenopausal women aged 50 or above participated in this research. The results showed that self-efficacy was significantly correlated with calcium intake ($r = .32$, $p < .001$) and exercise ($r = .25$, $p < .01$). A study of 103 elderly adults (age>65)

examined the relationship between self-efficacy and exercise. The result showed that self-efficacy was significantly correlated with regular exercise ($r = .46$, $p < .01$) (Walcott-McQuigg & Prohaska, 2001).

Piaseu, Schepp, and Belza (2002) used Bandura's (1997) Social Cognitive Theory as a framework to support the theoretical model for their research. They recruited 140 young women who were enrolled in the first year of a nursing program in Thailand. The independent variable was osteoporosis self-efficacy and the dependent variable was osteoporosis preventive behaviors (Calcium intake and exercise). After the intervention program, calcium intake and exercise were predicted by self-efficacy ($\beta = .38$, $p < .05$; $\beta = .36$, $p < .01$) (Piaseu, Schepp, & Belza, 2002).

Wallace (2002) examined the relationship between personal characteristics and osteoporosis protective behaviors including weight-bearing exercise and calcium intake in a random sample of 273 females, aged 17-64. Exercise self-efficacy was a positive predictor of weight-bearing exercise and dietary calcium intake group ($F = 43.16$, $p < .001$) (Wallace, 2002). In Ievers-Landis, Burant, Drotar, Morgan, Trapl, and Kwoh's (2003) research, researchers developed and tested a model based on Bandura's social cognitive theory to predict healthy lifestyle behavior for the prevention of osteoporosis. Participants were 354 girls, aged 8-11, recruited from local Girl Scout troops. The result revealed that self-efficacy was positively correlated with calcium intake ($r = .269$, $p < .01$)(Ievers-Landis et al., 2003). Resnick and Nigg's (2003) study showed that self-efficacy was significantly correlated with exercise ($r = .78$, $p < .05$) (Resnick & Nigg, 2003). A study of Petosa et al. (2003) also indicated that self-efficacy was significantly correlated with exercise

(r=.305, p<.001) (Petosa, Suminski, & Hortz, 2003).

Knowledge of osteoporosis

Knowledge is the awareness and understanding of factors, truths or information obtained through experience or learning. Personal knowledge is defined as recognition of a new pattern through processing by the human being. The processing may consist of any combination of human and environmental interaction (experience), rational intuiting, appraisal, active comprehension, and personal judgment (p. 919) (Sweeney, 1994). Personal knowledge is objective because it makes a person aware of how knowledge affects a situation (Polanyi, 1958).

The effects of knowledge on behavior are documented (Ievers-Landis et al., 2003; Piaseu et al., 2002; Yu & Huang, 2003). Knowledge, attitudes, and activities regarding osteoporosis of middle-aged and elderly women in Taipei, Taiwan were explored by Yu & Huang (2003). A community population-based cross-sectional study was conducted with a randomly-selected sample of 447 females aged 40 and over. The majority of subjects did not perform any activity to prevent osteoporosis. The result showed that previous knowledge was a predictor in predicting preventive activity (β= .35, p<.001)(Yu & Huang, 2003). A study of 140 young women who were enrolled in the first year of a nursing program in Thailand demonstrated that knowledge of osteoporosis was significantly correlated with calcium intake (r=.24, p<.05) (Piaseu et al., 2002). In a study by Ievers-Landis et al., (2003), the result showed that knowledge of weight-bearing physical activity significantly predicted calcium intake (r=.117, p<.05). The result of 270 low-income Mexican-American women aged from 18 to 77 participating in Orces's et al.

(2003) study also indicated that knowledge of osteoporosis was a determinant of osteoporosis prevention (OR, 1.02; 95% CI, 1.01- 1.03; p= .004) (Orces et al., 2003).

Social Support

Social support is a form of interpersonal interaction which provides psychological support or specific aid to help solve a problem, where the helper mainly comes from personal social connections, not from strangers. Social support is in the process of sharing, giving and taking (Simmons, 1994). Norbeck views social support as central to the caring goals of nursing (Norbeck, 1988), and as an essential part of nursing science. Social support has been studied over the years by various fields, and is an increasingly popular concept in research (Hutchison, 1999). Most measures of social support fall into one of three categories: the degree of social interaction, received social support, and perceived social support (Cornman, Lynch, Goldman, Weinstein, & Lin, 2004).

Social support is the functional consequence of an individual's social ties. It can be defined as a network of interpersonal relationships that provide companionship, assistance, and emotional nourishment (Pender et al., 2002). It is the assistance and protection given to others, especially to individuals (Wortman & Dunkel-Schetter, 1987). It is typically divided into four subtypes, which include emotional (esteem, effect, trust, concern, and listening), instrumental (aid in kind, money, labor, time, and modifying environment), appraisal (affirmation, feedback, and social comparison), and informational support (advice, suggestion, directive, and information) (House, 1981).

Perceived social support will be tested in this study for two reasons. First, many previous studies have shown that perceived support has a great impact on health behavior

(Ievers-Landis et al., 2003; Miller, Trost, & Brown, 2002; Roberto & Reynolds, 2001; Walcott-McQuigg & Prohaska, 2001; Wang, 2001). Second, received support is often confounded with need for assistance and therefore may not accurately reflect the actual availability of support (Sherbourne & Hays, 1990).

The beneficial effects of perceived social support on health behaviors are well documented (Ievers-Landis et al., 2003; Miller et al., 2002; Roberto & Reynolds, 2001; Walcott-McQuigg & Prohaska, 2001; Wang, 2001) . In Ievers-Landis, Burant, Drotar, Morgan, Trapl, and Kwoh's (2003) research, the results revealed that family support significantly predicted calcium intake ($r = .166$, $p < .05$) and friend support also significantly predicted calcium intake ($r = .065$, $p < .05$) (Ievers-Landis et al., 2003). 21 women diagnosed with osteoporosis, aged 53-89, living in rural communities participated in focus groups to explore the functional and psychosocial consequences of living with osteoporosis (Roberto & Reynolds, 2001). Women stressed the benefits of listening to and talking with supportive friends.

Wang's (2001) research included 284 women, aged 60-69, living in Pingtung County, Taiwan. A survey-interview method was used for data collection. Two groups of elderly women were recruited for data collection: 168 in the younger group (mean age 64.66) and 116 in the older group (mean age 75.59). According to the result, social support was positively correlated with health-promoting life style ($r = .505$, $p < .01$)(Wang, 2001). A study of 350 college students with a mean age of 21 years indicated that family social support was significantly correlated with exercise ($r = .27$, $p < .001$) and friends' social support was also significantly correlated with exercise ($r = .33$, $p < .001$) (Petosa et

al., 2003). Resnick and Nigg's (2003) study showed that social support was significantly correlated with exercise ($r=.37$, $p<.05$) (Resnick & Nigg, 2003).

Social Capital

Social capital refers to the values and beliefs that citizens share in their everyday dealings and which give meaning and provide design for all sorts of rules. The use of the word 'capital' implies that we are dealing with an asset. The word "social" tells us that it is an asset attained through membership in a community (Maskell, 2000). It is an intrinsically social and political phenomenon, an emergent property of institutions and group practices (Szreter, 2000). Social capital is a community-based variable within the social context. It has captured the interest of many researchers in different disciplines such as public health, family social science and sociology. A growing number of health researches have begun to explore the implications of the concept of social capital (Shortt, 2004). Social capital not only emphasizes primary connections such as kinship but also secondary connections such as social network and civic engagement (Field, Schuller & Baron, 2000) which this study will focus on.

Putnam (2000) considers that social capital refers to connections in individuals' social networks and the norms of reciprocity and trustworthiness that arise from them (Putnam, 2000). Social capital constitutes the "glue" that holds community together (Hancock, 2001). It has been claimed to be important for the maintenance of a population's health (Kawachi, Kennedy, Lochner, & Prothrow-Stith, 1997). Social capital is considered as a modifying condition which independently impacts outcomes but which is not influenced by intervention and mediating mechanisms (Sorensen et al., 2003).

Social capital may influence the health behavior of neighborhood residents by promoting more rapid diffusion of health information or increasing the likelihood that healthy norms of behavior are adopted and by exerting social control over deviant health-related behavior (Kawachi & Berkman, 2000).

The impact of social capital on individual behavior is documented. Lindstrom (2003) considered that social participation and trust are two fundamental aspects of social capital. The aim of her study was to investigate the impact of social participation, trust and the miniaturization of community on daily and intermittent smoking. A total of 13715 randomly selected persons born in 1919-1981 were interviewed using a postal questionnaire. The results indicated that daily smoking was negatively associated with social capital (OR= 2.6, $p<.05$) (Lindstrom, 2003). Crosby et al. (2003) assessed the state-level association between social capital and adolescents' sexual risk and protective behaviors. The result showed that social capital was negatively correlated with sexual risk behavior (r=-.48- -.72, $p<.01$) and positively correlated with protective behavior (r= .45-.67, $p<.01$) (Crosby, Holtgrave, DiClemente, Wingood, & Gayle, 2003).

Social capital is a potentially important concept for health promotion and behavior. However, research into health and social capital is still in its infancy and much work remains to be done such as investigating the influence of social capital on osteoporosis preventive behaviors including calcium intake and exercise. Therefore, surveying people's osteoporosis preventive behaviors in Taiwan's countryside and predicting the relationship between osteoporosis preventive behaviors and social capital holds great potential as a focus of research.

Relationships among Exogenous and Endogenous Variables

Exogenous Variables and Osteoporosis Self-Efficacy (calcium intake and exercise)

In Ievers-Landis, Burant, Drotar, Morgan, Trapl, and Kwoh's (2003) research, the results revealed that knowledge of weight-bearing physical activity (WBPA) was significantly correlated with calcium intake self-efficacy ($r = .154$, $p < .01$); family support was significantly correlated with calcium self-efficacy ($r = .155$, $p < .01$) and friend support was correlated with calcium self-efficacy ($r = .113$, $p < .05$) and WBPA self-efficacy ($r = .107$, $p < .05$) (Ievers-Landis et al., 2003). Piaseu et al. (2002) described the significant correlation between osteoporosis knowledge and osteoporosis self-efficacy ($r = .31$, $p < .05$). Resnick and Nigg (2003) tested the impact of components from two theoretical perspectives that explain exercise behavior: social cognitive theory and the transtheoretical model. The results showed that social support was positively correlated with self-efficacy ($r = .30$, $p < .05$) and age was negatively correlated with self-efficacy ($r = -.24$, $p < .05$).

To sum up, factors influencing osteoporosis self-efficacy include knowledge, social support, and age.

Exogenous Variables and Knowledge of Osteoporosis

A study of a convenience sample of 95 women aged from 30 to 63 years living in Taipei, Taiwan showed that age ($r = .64$, $p < .05$) was correlated with knowledge of osteoporosis (Chang, Chen, Chen, & Chung, 2003). In Ieves-Landis, Burant, Drotar, Morgan, Trapl, and Kwoh's (2003) research, the results revealed that family support significantly predicted knowledge of calcium intake ($r = .125$, $p < .05$) and knowledge of

weight-bearing physical activity (r=.162, p<.01) and that friend support significantly predicted knowledge of weight-bearing physical activity (r=.111, p<.05) (Ievers-Landis et al., 2003).

According to the reviewed literature, age and social support are the factors influencing knowledge of osteoporosis.

Exogenous Variables and Social Support

Demographic factors may affect availability and accessibility of social support (Broadhead et al., 1983). A sample of 179 older adults whose mean age was 85.1 in Resnick and Nigg's (2003) study showed that age was negatively correlated with social support (r=-.15, p<.05). A study of 98 community-dwelling subjects aged ranging from 18 to 67 indicated that years of education was positively related to social support (r= .21, p<.05) (Muhlenkamp & Sayles, 1986). The result of a study of 833 mostly low-income women with a mean age of 46.2 showed that years of education was significantly correlated with social support (F=24.96, p<.001) (Katapodi et al., 2002).

Social capital has drawn much attention recently. Sorensen, Emmons, and Hunt et al. (2003) mentioned that social capital may affect social support in some way. However, there is a lack of literature supporting this statement so far. Therefore, it is important to do further research to examine this statement (Sorensen et al., 2003).

To sum up, factors influencing social support include age, years of education, and social capital.

Introduction to the Hakka

The Hakka or "guest people" are an ethnic group of Han Chinese and are a minority in Taiwan. The total population of Hakka is around two to three million in Taiwan, but the precise number is still unknown. They originated in Central China and gradually migrated southward to flee from invasions, civil wars, famine, and population pressure. Historically, the Hakka have had five major migration waves. In the fourth and fifth migration waves, 1644 A.D. and later, the Hakka started to migrate from mainland China to Taiwan. Local people gave these people a name-- Hakka-- during the Song dynasty (960-1279 A.D.) in order to distinguish them from local inhabitants and migrant northerners who can be distinguished from their spoken language, customs and food (Lee, 2001). Because of the migration experiences, generally speaking, Hakka people have developed an ethos spirit of collaboration and cooperation and strong emphasis on family relationships, blood kinship and ethnic ties.

Conceptual Framework

Social cognitive theory is a comprehensive theory of human behavior that has proven useful in studies of health behavior (Petosa et al., 2003), and the concept of social capital has drawn much attention recently. Therefore, based on Social Cognitive Theory (Bandura, 1986, 1997, 2004) and the conceptual framework for addressing the social context of health behavior (Sorensen et al., 2003), a theoretical model of factors influencing osteoporosis preventive behaviors was developed for this study (Figure 1.1). According to the reviewed literature, the factors influencing osteoporosis preventive behaviors included personal factors (age, educational level, self-efficacy for calcium intake, self-efficacy for exercise, and knowledge of osteoporosis) and social factors (social support and social capital). The outcome variables were calcium intake and exercise.

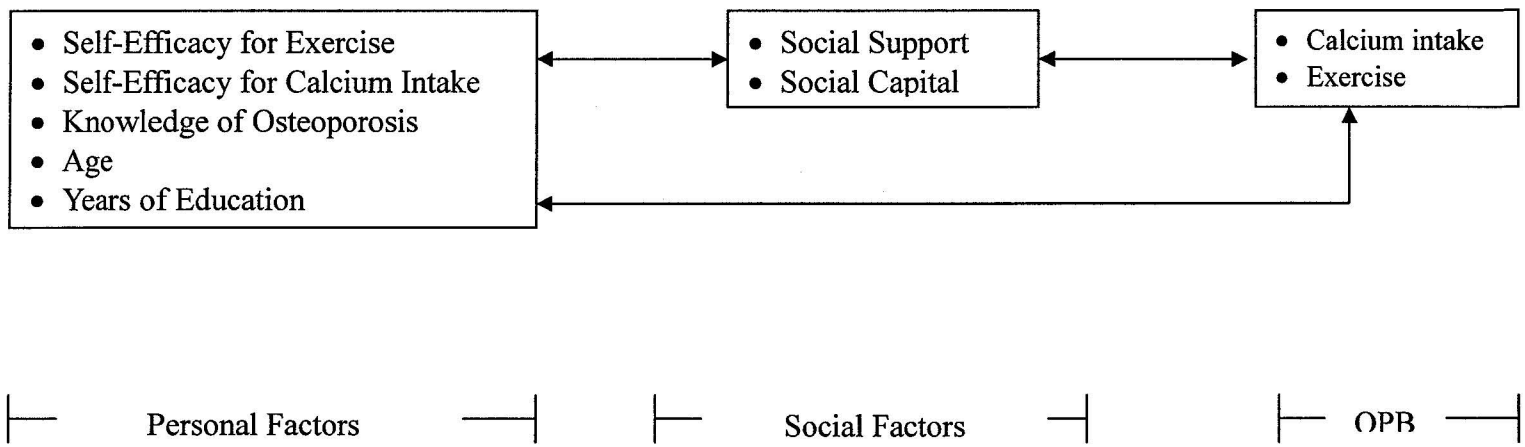


Figure 1.1: The theoretical model of factors influencing osteoporosis preventive behaviors

Research Questions

The issue of osteoporosis preventive behaviors among Hakka living in the countryside in Taiwan has rarely been studied. Therefore, this study developed a hypothesized model of factors influencing osteoporosis preventive behaviors (Figure 1.2) to predict the direct and indirect effects of individual and social factors on osteoporosis preventive behaviors among Hakka. This model raised the following research questions:

1. What osteoporosis preventive behaviors are there among Hakka?
2. What are the significant relationships among endogenous variables (years of education, self-efficacy for calcium intake, self-efficacy for exercise, knowledge of osteoporosis, social support, calcium intake and exercise) and exogenous variables (age and social capital)?
3. What are the coefficients of the paths in the model of factors influencing osteoporosis preventive behaviors?
4. How does the data fit the model of factors influencing osteoporosis preventive behaviors?

Research Hypothesis

According to the hypothesized model of factors influencing osteoporosis preventive behaviors (see Figure 1.2), the following hypotheses were measured.

(1) Self-efficacy for calcium intake positively influences calcium intake.

(2) Self-efficacy for exercise and social capital positively influence exercise.

(3) Knowledge of osteoporosis and social support positively influence self-efficacy for calcium intake and self-efficacy for exercise.

(4) Social support and years of education positively influence knowledge of osteoporosis, but age negatively influences knowledge of osteoporosis.

(5) Years of education and social capital positively influence social support, but age negatively influences social support.

(6) Age negatively influences years of education.

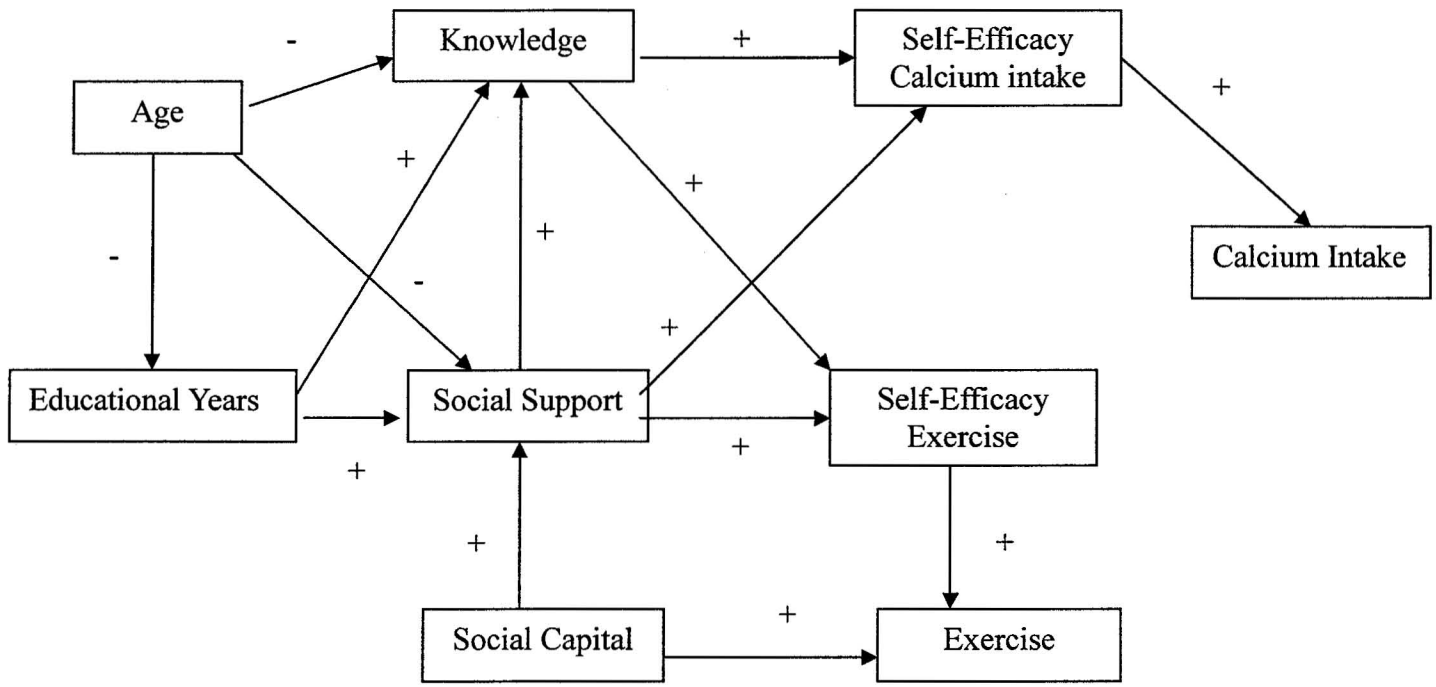


Figure 1.2: The hypothesized model of factors influencing osteoporosis preventive behaviors

Definitions

1. Knowledge of osteoporosis is defined as a perception of risk factors for osteoporosis and strategies for prevention in terms of increased calcium intake and weight-bearing exercise. The Facts on Osteoporosis Quiz (FOOQ) (Ailinger, Lasus, & Braun, 2003) was used to measure knowledge of osteoporosis.
2. Self-efficacy for exercise is defined as the individual's confidence to perform osteoporosis preventive behaviors in the domain of increased weight-bearing exercise. The Osteoporosis Self-Efficacy Scale (OSE)- Physical activity (Horan, Kim, Gendler, Froman, & Patel, 1998) was used to measure self-efficacy for exercise.
3. Self-efficacy for calcium intake is defined as the individual's confidence to perform osteoporosis preventive behaviors in the domain of increased dietary calcium intake. The Osteoporosis Self-Efficacy Scale (OSE)- Calcium intake (Horan et al., 1998) was used to measure self-efficacy for calcium intake.
4. Social support is defined a person's perception of aid, assistance, or support from other people (families, relatives, neighbors or friends). The Personal Resource Questionnaire 85-Part 2 (PRQ- Part 2) (Brandt & Weinert, 1981) was used to measure social support.
5. Social capital refers to the quantity and quality of social relationships such as formal and informal social connections as well as norms of reciprocity and trust that exist in a place of community (Kawachi & Berkman, 2000). The Scale of Social Capital (SSC) (Onyx & Bullen, 2000) was used to measure social capital.

6. Osteoporosis preventive behaviors are defined as an individual's primary preventive behavior including exercise and calcium intake that help to decrease the risk of developing osteoporosis. The Scale of Calcium Intake (SCI) (Lin, 1999) was used to measure calcium intake and the Physical Activity Questionnaire (PAQ) (Liu et al., 2001) was used to measure exercise.

Assumptions

Assumptions addressed in this study included the following:

1. Behavior is influenced by personal and socio-structural factors.
2. Osteoporosis preventive behavior can help people to prevent osteoporosis.
3. Hormone replacement therapy is not the first choice for preventing osteoporosis.

CHAPTER 3

METHODOLOGY

Research Design

This was a non-experimental, cross-sectional design. The purpose of this study was to assess osteoporosis preventive behavior; measure the relationships among factors influencing OPB; measure a causal model of factors influencing OPB; and predict the direct and indirect effects of personal and social factors on OPB among Hakka living in Taichung County in Taiwan. The seven structural equations of the model are as follows.

Equation 1: Educational Years (Edu) = Age

Equation 2: Knowledge of Osteoporosis (K) = Age + Social Support (SP) + Years of Education (Edu)

Equation 3: Social Support (SP) = Age + Years of Education (Edu) + Social Capital (SC)

Equation 4: Self-Efficacy for Calcium Intake (SECa) = Knowledge of Osteoporosis (K) + Social Support (SP)

Equation 5: Self-Efficacy for Exercise (SEE) = Knowledge of Osteoporosis (K) + Social Support (SP)

Equation 6: Calcium Intake (CI) = Self-Efficacy for Calcium Intake (SECa)

Equation 7: Exercise (E) = Self-Efficacy for Exercise (SEE) + Social Capital (SC)

Sampling

Convenience and snowball sampling were used in this study. The criteria for choosing community-dwelling participants were that they must be people living in Dongshih, Taiwan; that they consider themselves as Hakka; over 18 ages; that they not be deaf and dumb; and that they who have the ability to speak Hakka or Mandarin to communicate with the interviewer.

Two methods of determining sampling size were used. These methods are described as follows. First, there should be a ratio of at least 5 subjects to each parameter to be estimated in path analysis (Hatcher, 2003). There are 23 parameters (14 path coefficients, 2 variances, and 7 errors) in this study; therefore, the minimum sampling size based on this rule of thumb is 115. Second, a large sample size is recommended for path analysis; ideally, the analysis should be based on at least 200 subjects (Hatcher, 2003).

In light of the above, 243 subjects were recruited for this study.

Research Setting

Dongshih, a Hakka town in Taichung County, was the research setting for this study. The population was 56,127 in 2004. The total number of residents aged 65 and over was 7,555 in 2005 (*Population of Taichung County*, 2005). The proportion of elderly people to general population was 13.5%. The official language in Taiwan is Mandarin. However, residents living in this town use their own dialect-- Hakka-- to communicate with each other in their daily life.

Dongshih has eight elementary schools, three junior high schools, and two

vocational senior high schools. In addition, it has seven small private hospitals and one health station. A serious earthquake hit this town in 1999, in which more than 800 people died. A lot of buildings were destroyed, including many houses, three elementary schools, one junior high school, one vocational school, and a bridge connecting Dongshih to nearby towns. Although some of these buildings have since been rebuilt, some people moved away from Dongshih. Accordingly, the population declined from around 80,000 to 56,127 at the time of this study.

Instrumentation

The nine variables of this study included age, years of education, calcium intake, exercise, social capital, self-efficacy for calcium intake, self-efficacy for exercise, social support, and knowledge of osteoporosis. These research instruments were selected based upon the theoretical process of development, acceptable established reliability and validity of original versions, the fact that the research instruments had been applied in diverse settings and to different populations, and they were not complicated.

At the end, eight instruments were used in this study: (a) Personal Resource Questionnaire 85-Part 2 (PRQ- Part 2) (Brandt & Weinert, 1981) was used to measure social support; (b) Osteoporosis Self-Efficacy Scale (OSE) for physical activity was used to measure self-efficacy for exercise; (c) Osteoporosis Self-Efficacy Scale (OSE) for calcium intake was used to measure self-efficacy for calcium intake (Horan et al., 1998) ; (d) Facts on Osteoporosis Quiz (FOOQ) (Ailinger et al., 2003) was used to measure knowledge of osteoporosis; (e) Scale of Social Capital (SSC) (Onyx & Bullen, 2000) was used to measure social capital; (f) Scale of Calcium Intake (SCI) (Lin, 1999) was used to

measure calcium intake; (g) Physical Activity Questionnaire (PAQ) (Liu et al., 2001) was used to measure exercise behavior; and (h) Demographic Questionnaire (DQ) was used to assess participants' demographic data. The researcher obtained a permission to use the instruments from the authors who developed the questionnaires (Appendices A1-F). These questionnaires are discussed below.

Personal Resource Questionnaire 85 (PRQ85)-Part 2

PRQ85- Part 2 was used to measure perceived social support (Appendices G1-G2). It is a 25-item scale based on Weiss's (1969, 1974) theoretical formulation of social support. The internal consistency reliability coefficients were 0.89 for the entire PRQ in a study under taken in 1981, and 0.91 and 0.93 in a study completed in 1987 (Weinert & Brandt, 1987). The assessment of convergent and discriminate validity was used to build construct validation (Weinert & Tilden, 1990).

This scale had already been translated into Chinese by Wang (1999) and had been used to test people in Taiwan. The reliability coefficients for the PRQ85-Part 2 were .90 among elderly women and .84 among the study's 34 nursing students. The test-retest reliability coefficient at an interval of one week was .80 among the nursing students. The total scores ranged from 25 to 175, with a higher score indicating a higher degree of perceived social support. This 25-item scale was used to measure the social support for 284 Taiwanese women. The result showed that age was negatively correlated with social support ($r = -.34$, $p < .01$), but social support was positively correlated with perceived health status ($r = .29$, $p < .01$), self-care agency ($r = .68$, $p < .01$), and well being ($r = .57$, $p < .01$) (Wang, 2001).

The Chinese-version 25-item PRQ85- Part 2 was a 7- point Likert scale with responses ranging from "strongly disagree" to "strongly agree". It was used to measure social support of 243 Hakka living in Dongshih, Taiwan. Cronbach's α was .77 in this study.

Osteoporosis Self-Efficacy Scale (OSE)

Horan, Kim, Gendler, Froman, and Patel (1998) developed and evaluated the 12-item Osteoporosis Self-Efficacy (OSE) Scale (Appendices H1- H2). This scale was developed as a measure of self-efficacy, or confidence, for behaviors related to physical activity and calcium intake. The sample in this study included 201 women participants, aged 35 to 95, who were not diagnosed to have osteoporosis. Factor analysis of responses to the self-efficacy items revealed a logical, theoretically meaningful two-factor structure, one for physical activity (6 items) and one for calcium intake (6 items). Internal consistency estimates for each of the two factors were in the .90s. Piaseu, Schepp and Belza (2002) used this scale to test osteoporosis self-efficacy among 140 Thai nursing students. The result indicated that exercise was associated with osteoporosis self-efficacy ($r= .21$, $p<.05$). The final version of the scale contains items reflecting initiation, maintenance, and persistence at osteoporosis preventive behaviors; thus OSE is a potentially beneficial research instrument.

When scoring the English-version OSE, first a ruler was used to measure in millimeters from the left anchor on the visual analogue to the line where the subject has marked, on each item. The line from "Not at all confident" to "Very confident" should measure exactly 10 cm (100 mm). The subject's score on each item should be measured

to the nearest millimeter. Thus the range for each item is 0-100.

The total score of the 6- item OSE-physical activity was used to measure self-efficacy for exercise, and its Cronbach's α was .92; the total score of the 6- item OSE-calcium intake was used to measure self-efficacy for calcium intake, and its Cronbach's α was .93 in this study.

Facts on Osteoporosis Quiz (FOOQ)

The Facts on Osteoporosis Quiz (FOOQ) is a 20-item scale (Appendices I1- I2). The development of FOOQ was based on Self-Care Deficient Theory. This scale uses a "True", "False", and "Don't know" format. It is calculated by the total number of correct responses in the FOOQ (ranging from 0 to 20). Cronbach's α was .83 (Ailinger et al., 2003). This scale was used to test for influencing factors on the knowledge of osteoporosis among 277 Israeli-Jewish women aged 45 and above. The test result showed that educational level was correlated with knowledge of osteoporosis ($r = .14$, $p<.05$) (Werner, Olchovsky, Shemi, & Vered, 2003). The FOOQ was used to measure knowledge of osteoporosis and its Cronbach's α was .78 in this study.

Scale of Social Capital (SSC)

The original Scale of Social Capital (SSC) was a 68-item questionnaire, with an additional 17 demographic items. Initial psychometric properties were obtained from administration to 1211 people, aged 18-65, in rural and urban areas in Australia (Onyx & Bullen, 2000). Exploratory factor analysis was used to construct the test's validity. Of the original 68 social capital items, only the 36 best, based on factor loading and item-total correlations, were retained. Chronbach's α was .84 for the 36 items with item-total

correlations in the range of 0.25-0.45. This scale was used to measure social capital of 496 subjects in a USA sample (O'Brien, Burdsal, & Molgaard, 2004). The result indicated that level of education was associated with social capital ($r=.20$, $p< .01$).

Among the 36 best social capital items, five were designed to measure the networks of employed persons. If the research subjects are not employed, they do not have to answer these five items (Onyx & Bullen, 2000). Most of my research subjects were self-employed, housewives, and farmers, not corporate employees; therefore, these five items were not included in this research (Appendices J1- J2).

The 31-item Scale of Social capital was a 4-point Likert scale with responses ranging from "None" to "Very much". The total scores ranged from 0 to 124, with a higher score indicating a higher degree of social capital. It was used to measure the social capital of 243 Hakka living in Dongshih, Taiwan. Cronbach's α was .84.

Scale of Calcium Intake (SCI)

This Chinese-version 9-item scale was developed by Lin (1999) and had already been used to measure osteoporosis preventive behavior among 329 Taiwanese women (Appendices K1- K2). Content validity was used to construct the validity of this scale. This scale was used to test the influencing factors on calcium intake among 357 working females aged 30 to 49. The test result showed that breast-feeding ($t = -2.03$, $p<.05$) and participation in sports clubs ($r= -.32$, $p<.01$) were correlated with calcium intake (Lin, 1999). The test-retest reliability coefficient at an interval of one week was .82 among 30 Taiwanese aged over 20. The total score of SCI was used to measure calcium intake.

Physical Activity Questionnaire (PAQ)

This Chinese-version 16-item questionnaire was developed by Liu, Woo, Tang, Ng, Ip, and Yu (2001) (Appendices L1- L2). The test-retest reliability was analyzed by Interclass Correlation Coefficient (ICC). It was .77, .7, and .8 for renal patients, cancer patients, and elderly subjects respectively, while that for all subjects was .74. Criterion-related validity was used in this questionnaire(Liu et al., 2001). This questionnaire was used to measure the exercise condition of 94 participants aged 64 to 84. The test result showed that women spent less energy on exercise activities (Liu et al., 2001). The PAQ was used to measure exercise.

Demographic Questionnaire (DQ)

The 9-item Demographic Questionnaire consisted of age, gender, years living in Dongshih, degree of participation in community activities, educational level/ years, marital status, spouse's educational level, and type of chronic disease. Among them, age and years of education were the two study variables in this study (Appendices M1- M2).

Three of the above-mentioned questionnaires--SSC, FOOQ, and OSE (calcium intake and physical activity)--are English-version questionnaires. Even though they have been tested in populations in different cultures, they have not been translated into Chinese yet. Therefore, translating the three questionnaires into Chinese was very important for this study.

Translation of Research Instruments

The purpose of this field test was to build up the initial reliability and validity of Chinese-version questionnaires among Scale of Social Capital (SSC) (Onyx & Bullen,

2000), Facts on Osteoporosis Quiz (FOOQ) (Ailinger, Lasus, & Braun, 2003), and Osteoporosis Self-Efficacy Scale (OSE) (Horan et al., 1998) among Taiwanese.

Ethical Considerations

Before collecting data for determining the initial reliability and validity of translated questionnaires, approval from the Committee on Human Studies, Institutional Review Board (IRB), University of Hawaii system, was obtained on May 2, 2005. A consent form was required to sign when each person agreed to participate in this study. Every participant was assigned a code number to ensure confidentiality. Any information that was obtained in connection with this study and that could be identified with participants remained confidential. All the data utilized in this study were destroyed at the completion of the study.

Process of translation

The researcher first obtained permission to use the instruments from the authors who developed the questionnaires. The questionnaires were translated from English to Chinese by a Taiwanese whose writing score on the TOEFL (Test of English as a Foreign Language) was 6 (highest mark is 6), and a doctoral student. Both of them were bilingual. Then the Chinese versions were back-translated into English by a bilingual person, whose first language was English, but understood Chinese and had experience in translation. Finally, a nursing professor examined the equivalence of both the original and back translated English questionnaire.

Procedures

This field test was a non-experimental, cross-sectional design. Convenience and

snowball sampling were used in this study. The criteria for choosing community-dwelling participants were that they be from Taiwan now living in Honolulu, be bilingual (speak and read Chinese and English), be aged 20 and above, and have the ability to communicate with the interviewer orally. One-at-a-time, face-to-face interviews were conducted.

The author of this study was the interviewer conducting this field test. Altogether, 36 subjects were interviewed using the English-version questionnaires. One week later, four subjects withdrew. Only 32 subjects were interviewed using the Chinese-version questionnaires. After subjects orally expressed their agreement to participate in the study, they were asked to sign the consent form. All subjects were notified of the purposes of the study and the length of the interview at the beginning of the interview. They were also informed that they could withdraw from or discontinue the interview any time, or refuse to respond to any question that they did not want to answer. The data collection site--choices included school or home was chosen by each participant.

In order to determine the face validity, all participants were asked to make their suggestions about the wording of the instruments. Two participants in the field test of Chinese-version OSE recommended that the line where the subject was supposed to mark would be clearer if it were marked underneath by numbers from 0 ("Not at all confident") to 10 ("Very confident"). The recommendation was accepted, and accordingly, the line of the Chinese-version OSE was marked from 0 ("Not at all confident") to 10 ("Very confident"). The English version was used first. One week later, the Chinese version was used on the same participants. A token amount of USD $ 10 was offered to each

participant in appreciation for their help, time, and cooperation.

SPSS 12 was used for data analysis. The two statistical tests were employed to determine the equivalence between the Chinese version and original English version. These tests include Cronbach's α reliability coefficients, and one-week test-retest reliability coefficients.

Result

The results of testing the equivalence between Chinese-version and English-version instruments can be seen in Table 3.1; and Table 3.2. Cronbach's α reliability coefficient for the English-version SSC, FOOQ, OSE-Calcium intake and OSE-Exercise was .90, .71, .90 and .89 respectively; and for the Chinese-version SSC, FOOQ, OSE-Calcium intake and OSE- Exercise was .90, .77, .95 and .95 respectively. The one-week test-retest correlation coefficient for SSC, FOOQ, OSE- Calcium intake and OSE-Exercise was .80, .87, .73 and .73 respectively. Polit and Hungler (1995) recommended that test-retest reliability coefficient be above .70 to be considered satisfactory. By that standard, the SSC, FOOQ, and OSE had acceptable reliability coefficients in the field test.

Table 3.1 Cronbach's α reliability coefficient for the SSC, FOOQ, OSE-Calcium intake, and OSE-Physical activity

	Reliability Coefficients	
Scales	English version (n=36)	Chinese version (n =32)
SSC	.90	.90
FOOQ	.71	.77
OSE- Calcium intake	.90	.95
OSE- Physical activity	.89	.95

Table 3.2 Test-retest reliability of the SSC, FOOQ, OSE-Calcium intake, and OSE-Physical activity between the Chinese and English versions

	English version (n=36)		Chinese version (n =32)		Test-retest correlation coefficients (n=32)
	Mean	SD	Mean	SD	
SSC	74.34	13.73	75.21	12.16	.80
FOOQ	11.38	3.49	11.97	2.88	.87
OSE-Calcium intake	37.65	11.49	38.11	11.44	.73
OSE-Physical activity	29.53	13.50	32.14	12.44	.73

Procedure of Data Collection

Before collecting data, approval from the Committee on Human Studies, Institutional Review Board (IRB), University of Hawaii system, was obtained on July 29, 2005. Participants were asked questions about their exercise habit, calcium intake, knowledge of osteoporosis, osteoporosis self-efficacy, and status of social support and social capital. This survey took about 40 to 50 minutes. I speak Hakka, Mandarin, and Holo, and had lived in Donghsih more than 10 years, so I was the interviewer. Structured scales and face-to-face interviews were used to collect data.

I looked for those who were willing to participate in this study through the assistance of four community residents who have lived in the community for over 60 years, a leader of Mother's Class, and a leader of Tai-chi Class. In this way, I was able to find local Hakka people who were interested in taking part in this study. Through the connections of these participants, I was able to get involved in local community activities, such as weddings, gatherings of Mother's Class, and school reunions.

A NTD (New Taiwan Dollars) $ 100 certificate valid at local 7-11 convenience stores was provided in appreciation of participants' help, time, and cooperation. In all, 243 participants were recruited. After the subjects orally expressed their agreement to participate in the study, they were asked to read a notification (Appendix N2) at the beginning of the interview. That clarified the purpose of the study and the length of the interview. They were also informed that they could withdraw from or discontinue the interview any time, or refuse to respond to any question that they did not want to answer.

Confidentiality of subjects was maintained via code number and protected files.

Any information that was obtained in connection with this study that could be identified with participants was kept confidential. No personal identifying information was included with the study results. All the data utilized in this study were destroyed at the completion of the study.

Data Analysis

LISREL 8 and SPSS 12 were used for data analysis. Seven steps were used to analyze and synthesize the data: (a) checking and editing the raw data; (b) coding the data and entering it into a computer file; (c) dealing with the missing data problem: two methods were used to deal with missing data: one method, useful for a multiple-item scale such as a Likert Scale, was that missing data were substituted by the mean value; and the other method was to delete cases selectively, on a variable-by-variable basis (Polit & Hungler, 1995); (d) examining whether the data were normally distributed; (e) analyzing the demographic characteristics and 9 research variables by examining the frequencies, means, standard deviations, actual ranges and possible range; (f) testing the relationships among independent and dependent variables by Pearson's correlation; and (g) using a path analysis to predict the parameters of the hypothesized causal model of factors influencing osteoporosis preventive behavior.

The model of factors influencing osteoporosis preventive behavior was examined through the maximum likelihood estimation (MLE) procedures that were performed using LISREL 8. The indicators of fit model using path analysis included a chi-square goodness-of-fit, the adjusted goodness-of-fit index (AGFI), the goodness-of-fit index

(GFI), the comparative fit index (CFI), the normed fit index (NFI) and the non-normed fit index (NNFI). Values in the GFI, AGFI, NFI, NNFI and CFI over .9 indicated an acceptable fit between model and data.

The Chi-square statistic provides a test of the null hypothesis that the theoretical model fits the data. If the null hypothesis is correct, then the obtained chi-square value should be small, and the p value associated with the chi-square should be relatively large. GFI (goodness-of-fit index) measures the relative amount of the variances and covariances in the sample covariance matrix that are predicted by the implied covariance matrix. AGFI (adjusted goodness-of-fit index) adjusts the GFI for degrees of freedom, resulting in lower values for model with more parameters (Bollen, 1989). NFI (normed-fit index) may be viewed as the percentage of observed-measure covariation explained by a given measurement or structural model. But sometimes it underestimates the goodness-of-fit in small samples. NNFI (non-normed fit index) has been shown to better reflect model fit at all sample sizes (Hatcher, 2003). CFI (comparative fit index) provides an accurate assessment of fit regardless of sample size.

Gantt Chart

The Gantt chart (Figure 3.1) depicted the scheduling of tasks of this study and showed the sequencing and interrelationships among tasks, including literature review; translation, pretest, and instruments revision; preparation of interviewer's instructions and field operation materials; building up connections with community; data collection; code and data preparation for analysis; data analysis; and report preparation. The duration of this study was from 03/2005 to 04/2006.

Task	Calendar Month of Project (03/2005- 04/2006)													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Literature Review														
Translation, pretest, and instruments revision														
IRB approval														
Preparation of interviewer's instructions and field operation materials														
Building up connections with community														
Data collection														
Code and data preparation for analysis														
Data analysis														
Report preparation														

Figure 3.1: Gantt chart

CHAPTER 4

RESULTS

This chapter presents results in four aspects. The first aspect describes the demographic characteristics and osteoporosis preventive behavior of 243 participants; and the means, standard deviations, actual ranges, and possible ranges of study variables. The second aspect uses a Pearson's correlation matrix to test research hypotheses. The third aspect concentrates on the original theoretical model that is examined using path analysis, followed by a modified model. The final aspect presents the direct, indirect and total effects of the exogenous variables on each endogenous variable.

The First Aspect: Participants' Data

Researcher invited 250 Dongshih Hakka residents to participate in this research; of these, 243 (97.2%), 123 females and 120 males accepted the invitation. The reasons cited by the seven who declined to participate in included lack of interest and unavailability. Among the participants, six were unable to turn in data, mainly because they complained that they could not find time to answer so many questions.

The characteristics of the participants are shown in Table 4.1. In terms of age, the subjects in the sample were between 18 and 82, with a mean age of 46.51 (SD = 14.53). 35% of the participants were involved in local community activities such as Tai-Chi and Mothers' Classroom. The number of years of education averaged 11.79 years, ranging from 0 to 24 years (SD = 4.08). More than half (52.26%) of the participants had lived in Dongshih for over 40 years (M = 41.05, SD = 16.70). Furthermore, 34.2% of the participants were diagnosed to have at least one kind of chronic disease; 35 people had

hypertension (14.4%), and 28 people had gout (11.5%).

Table 4.1 Participants' Demographic Data (N=243)

Items		n	%
Age	18-30	31	12.8
	31-40	57	23.5
	41-50	65	26.7
	51-60	43	17.7
	61-70	30	12.3
	71-80	15	6.2
	>80	2	0.8
Gender	Female	123	50.6
	Male	120	49.4
Years of living in	1-10	12	4.9
Dongshih	11-20	21	8.6
	21-30	29	11.9
	31-40	53	21.8
	41-50	62	25.5
	51-60	36	14.8
	61-70	18	7.4
	>70	11	4.5
	Missing	1	0.4
Participating in	No	158	65
Community Activities	Yes	85	35
Years of Education	0	6	2.5
	1-6	37	15.2
	7-12	113	46.5
	>=13	87	35.8

Table 4.2 Types of Chronic Diseases among the Participants (N= 243)

Types of Chronic Disease	n	%
No chronic disease	160	65.8
Hypertension	35	14.4
Gout	28	11.5
Diabetes	12	4.9
Cardiovascular disease	12	4.9
Arthritis	9	3.7
Osteoporosis	9	3.7
Renal Disease	4	1.6
Pulmonary disease	1	.4
Other	16	6.6

Osteoporosis Preventive Behaviors

Osteoporosis preventive behaviors included calcium intake and exercise. In terms of calcium intake, the mean of daily calcium intake by the Hakka people in Dongshih, Taiwan from milk, yogurt, cheese, tofu, dry tofu, small dry fish, kelp, beans, and dark colored vegetables (Appendix N) was 352.67mg (SD= 152.28). Meanwhile, age was negatively correlated with calcium intake ($r = -.19$, $p<.01$). Moreover, age was negatively correlated with taking calcium from milk ($r = -.14$, $p<.05$), yogurt ($r = -.29$, $p<.01$), cheese ($r = -.22$, $p<.01$), tofu ($r = -.17$, $p<.05$), dry tofu ($r = -.14$, $p<.05$), kelp ($r = -.28$, $p<.01$), and beans ($r = -.18$, $p<.01$); but age was positively correlated with taking calcium from dark colored vegetables ($r = .23$, $p<.01$). In terms of exercise, 59.67% of Hakka people surveyed in this research exercised regularly (more than three times a week). As for the kcal consumption in exercise among participants, the minimum was 0, and maximum was 6840 (mean= 1430.32; SD= 1323.08).

The study variables of this study included calcium intake, exercise, social capital, self-efficacy for calcium intake, self-efficacy for exercise, social support and knowledge of osteoporosis. The total scores of the SCI scale, PAQ scale, SCC scale, OSE-CI scale, OSE-PA scale, PRQ 85- Part 2, and FOOQ scale were used in the analysis. The mean scores, standard deviations, actual ranges, and possible ranges of study variables were shown in Table 4.3.

Table 4.3

Means, Standard Deviations, Actual Ranges, and Possible Ranges of Study Variables (N=243)

Variables	Scale	Mean	SD	Actual Range	Possible Range
CI	**SCI**	51.16	19.23	4-113	0-225
Ex	**PAQ**	1430.32	1323.08	0-6840	0 - ∞
SC	**SCC**	76.76	10.38	51-102	31-124
SECa	**OSE-CI**	38.89	12.23	0-60	0-60
SEE	**OSE-PA**	33.89	14.22	0-60	0-60
SP	**PRQ85**	109.76	12.69	61-141	25-175
K	**FOOQ**	12.07	3.01	4-18	0-20

Note: CI= calcium intake, Ex= exercise, SC= social capital, SECa= self-efficacy for calcium intake, SEE= self-efficacy for exercise, SP= social support, K= knowledge.

The Second Aspect: Research Hypotheses

Six research hypotheses were addressed in this study. The relationships between two study variables of the research hypotheses were tested using Pearson's correlation (Table 4.4). The test results were as follows:

The first hypothesis was that self-efficacy for calcium intake positively influences calcium intake. The result showed that self-efficacy for calcium intake significantly positively influenced calcium intake ($r=.34$, $p<.001$), indicating that Hakka people with high levels of self-efficacy for calcium intake had more calcium intake.

The second hypothesis was that self-efficacy for exercise and social capital positively influence exercise. The result showed that self-efficacy for exercise and social capital significantly positively influenced exercise ($r=.49$, $p<.001$; $r=.26$, $p<.001$), indicating that Hakka people with high levels of self-efficacy for exercise and social capital had more exercise behavior.

The third hypothesis was that knowledge of osteoporosis and social support positively influence self-efficacy for calcium intake and self-efficacy for exercise. The results showed that a significant positive relationship between knowledge of osteoporosis and self-efficacy for calcium intake ($r=.23$, $p<.001$), and a significant positive relationship between social support and self-efficacy for calcium intake ($r=.40$, $p<.001$) indicated that Hakka people with high levels of knowledge of osteoporosis and social support had more self-efficacy for calcium intake. In addition, knowledge of osteoporosis and social support also significantly positively influenced self-efficacy for exercise ($r=.20$, $p<.01$; $r=.31$, $p<.001$), indicating that Hakka people with high levels of knowledge of

osteoporosis and social support had more self-efficacy for exercise.

The fourth hypothesis was that social support and years of education positively influence knowledge of osteoporosis, while age negatively influences knowledge of osteoporosis. The results showed that social support and years of education significantly positively influenced knowledge of osteoporosis ($r=.28$, $p<.001$; $r=.40$, $p<.001$), indicating that Hakka people with high levels of social support and years of education had more knowledge of osteoporosis, while age significantly negatively influenced knowledge of osteoporosis ($r= -.31$, $p<.001$), indicating that older Hakka people had less knowledge of osteoporosis.

The fifth hypothesis was that years of education and social capital positively influence social support, while age negatively influences social support. The results showed that years of education and social capital significantly positively influenced social support ($r=.17$, $p<.05$; $r=.52$, $p<.001$), while age significantly negatively influenced social support ($r= -.18$, $p<.01$), indicating that Hakka people with more years of education and social capital had more social support, but older Hakka people had less support.

The final hypothesis was that age negatively influences years of education. The result showed that age significantly negatively influenced years of education ($r= -.68$, $p<.001$), indicating that older Hakka people had fewer years of education.

Table 4.4 Correlation Matrix of Study Variables

Variable	Age	SC	Edu	K	SP	SECa	SEE	CI	Ex
Age	1.00								
SC	-.07	1.00							
Edu	-.68***	.11	1.00						
K	-.31***	.15*	.40***	1.00					
SP	-.18**	.52***	.17*	.28***	1.00				
SECa	-.02	.35***	.09	.23***	.40***	1.00			
SEE	.05	.33***	.06	.20**	.31***	.64***	1.00		
CI	-.19**	.23***	.14	.13	.26***	.34***	.27***	1.00	
Ex	.12*	.26***	-.09	.01	.19**	.30***	.49***	.19**	1.00

Note: SC= social capital, Edu= years of education, K= knowledge, SP= social support, SECa= self-efficacy for calcium intake, SEE= self-efficacy for exercise, CI= calcium intake, Ex= exercise.

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

The Third Aspect: Model Assessment and Modification

Path analysis was performed to test the theoretical model presented in Figure 1.2. All analyses were conducted using the LISREL procedure. These analyses used the maximum likelihood method of parameter estimation, and all analyses were performed on the correlation matrix presented in Table 4.3. Hatcher (2003) suggested that in assessing whether a theoretical model provided a good fit to the data, there were a number of statistical tests and goodness-of-fit indices that must be consulted. These characteristics included (p. 197) the following: the p value associated with the model chi-square test should exceed .05; the closer the chi-square to 1.00, the better; the comparative fit index (CFI), non-normed index (NFI), and the non-normed fit index (NNFI) should all exceed .9; and the absolute value of the t statistics for each path coefficients should exceed 1.96.

In addition, it was suggested that the goodness-of-fit index (GFI) and adjusted goodness-of-fit index (AGFI) were used to assess the model fit (Joreskog & Sorbom, 1993). Therefore, the goodness-of-fit indices in this study included chi-square, GFI, AGFI, NFI, NNFI and CFI (Table 4.6.). Values in the GFI, AGFI, NFI, NNFI and CFI over .9 indicated an acceptable fit between model and data.

Finally, when the theoretical model needed to be modified, the model modifications should follow two suggestions: make as few modifications as possible; and any modifications should be justified by existing theory or prior research (Hatcher, 2003).

Process for Model Modification

The process of model modification in this study included five steps. First step: based on the initial theoretical model, seven equations were entered into the path analysis. The first equation was that years of education were predicted by age; the second equation was that knowledge of osteoporosis was predicted by age, social support, and years of education; the third equation was that social support was predicted by age, years of education, and social capital; the fourth equation was that self-efficacy for calcium intake was predicated by knowledge of osteoporosis and social support; the fifth equation was that self-efficacy for exercise was predicted by knowledge of osteoporosis, and social support; the sixth equation was that calcium intake was predicted by self-efficacy for calcium intake and knowledge of osteoporosis; and the last equation was that exercise was predicted by self-efficacy for exercise, knowledge of osteoporosis, and social capital.

In the first step, the output of path analysis showed that the chi-square was 148.60 with 21 degrees of freedom. The p-value for this model was .00, indicating that the initial theoretical model did not fit the data; therefore, it was rejected (Table 4.5).

According to the output of the first step, the modification indices suggested adding a path from self-efficacy for exercise (SEE) to self-efficacy for calcium intake (SECa) to decrease the chi-square from 148.80 to 46.05. Therefore, a path from self-efficacy for exercise (SEE) to self-efficacy for calcium intake (SECa) was added to the fourth equation that was the second step. The fourth equation was modified so that self-efficacy for calcium was predicated by knowledge of osteoporosis, social support, and self-efficacy for exercise. The output showed that the chi-square was 46.05 with 20

degrees of freedom and the p-value for the revised model 1 was .00, indicating that the revised model 1 did not fit the data; therefore, it was rejected (Table 4.5).

Then, the output of the second step of the modification indices recommended adding a path from social capital (SC) to self-efficacy for exercise (SEE) to decrease the chi-square from 46.05 to 33.82. Therefore, a path was added from social capital (SC) to self-efficacy for exercise (SEE) as the third step. The fifth equation was modified so that self-efficacy for exercise was predicted by knowledge of osteoporosis, social support, and social capital. The output showed that the chi-square was 33.82 with 19 degrees of freedom and the p-value for the revised model 2 was .02, indicating that the revised model 2 did not fit the data; therefore, it was also rejected (Table 4.5).

Furthermore, the output of the third step of the modification indices recommended adding a path from age to calcium intake to decrease the chi-square from 33.82 to 24.97. Therefore, a path was added from age to calcium intake as the fourth step for the revised model 3. The sixth equation was modified so that calcium intake was predicted by self-efficacy for calcium intake and age. The output showed that the chi-square was 24.97 with 18 degrees of freedom and the p-value for the revised model 3 was .13, indicating that the revised model 3 did fit the data; therefore, it was retained (Table 4.5).

Ultimately, model trimming was performed. All paths with a level of significance greater than .05 were dropped (Page, 1993). As a result, in the fifth step, the paths from age to knowledge of osteoporosis, from years of education to social support, from knowledge of osteoporosis to self-efficacy for calcium intake were deleted from the revised model 3 to produce the revised model 4 (Figure 4.1). The output of the fifth step

showed that X^2 was 26.99 with 21 degrees of freedom; the P-value for this model was .17; goodness-of-fit index (GFI) was .98; adjusted goodness-of-fit index (AGFI) was .95; normed fit index (NFI) was .96; non-normed fit index (NNFI) was .98; and comparative fit index (CFI) was .99 (Table 4.5). The results suggested that the revised model 4 fit the data well.

Based on testing, modification, and trimming, a saturated model was produced. The path diagram of the revised model 4 with its path coefficient (β) and squared multiple correlation (R^2) are shown in Figure 4.1.

In the model, 46% of the total variance in years of education was accounted for by age (F= 201.17, p< .001); 21% of total variance in knowledge of osteoporosis was accounted for by years of education and social support (F=30.07, p< .00); 29% of total variance in social support was accounted for by social capital and age (F=47.76, p< .001); 46% of total variance in self-efficacy for calcium intake was accounted for by self-efficacy for exercise and social support (F=92.50, p< .001); 15% of total variance in self-efficacy for exercise was accounted for by knowledge of osteoporosis, social support, and social capital (F=13.43, p< .001); 16% of total variance in calcium intake was accounted for by age and self-efficacy for calcium intake (F=30.07, p< .00); and 25% of total variance in exercise was accounted for by social capital and self-efficacy for exercise (F=30.83, p< .001).

The proportion of total variance in years of education, knowledge of osteoporosis, social support, self-efficacy for calcium intake, self-efficacy for exercise, calcium intake and exercise accounted for by their predictors in the equations was significant (p< .05).

Table 4.5 Process and Results for Model Modification

Path Relationships & Estimates	X^2	df	p	GFI	AGFI	NFI	NNFI	CFI
Step 1: Initial Theoretical Model	148.60	21	.00	.89	.76	.76	.62	.78
(1) Edu = - 0.68*age, Error= 0.54 , $R^2 = 0.46$								
(2) K = 0.34*edu + 0.22*SP - 0.039*age, Error= 0.79 , $R^2 = 0.21$								
(3) SP = 0.032*edu - 0.12*age + 0.51*SC, Error= 0.71 , $R^2 = 0.29$								
(4) SECa = 0.13*K + 0.36*SP, Error= 0.83 , $R^2 = 0.17$								
(5) SEE = 0.13*K + 0.28*SP , Error= 0.89 , $R^2 = 0.11$								
(6) CI = 0.34*SECa, Error= 0.88 , $R^2 = 0.12$								
(7) Ex = 0.44*SEE + 0.14*SC, Error= 0.75 , $R^2 =$ 0.24								
Step 2: Revised Model 1: Adding a path from SEE to SECa	46.05	20	.00	.96	.91	.93	.92	.96
(4) SECa = 0.062*K + 0.20*SP + 0.57*SEE, Error= 0.54 , $R^2 = 0.46$								
Step 3: Revised Model 2: Adding a path from SC to SEE	33.82	19	.02	.97	.93	.95	.95	.97
(5) SEE = 0.12*K + 0.15*SP + 0.2*SC, Error= 0.85 , $R^2 = 0.15$								
Step 4: Revised Model 3: Adding a path from Age to Ca	24.97	18	.13	.98	.94	.96	.98	.99
(6) CI= 0.34*SECa - 0.18*age, Error= 0.84 , $R^2 =$ 0.16								

	X^2	df	p	GFI	AGFI	NFI	NNFI	CFI
Step 5: Revised Model 4: Trimming by dropping paths with significance level greater than .05: deleting paths from age to K, from Edu to SP, from K to SECa. (1) Edu = - 0.68*age, Error= 0.54 , R^2 = 0.46 (2) K = 0.37*edu + 0.22*SP, Error= 0.79 , R^2 = 0.21 (3) SP= - 0.14*age + 0.51*SC, Error= 0.71 , R^2 = 0.29 (4) SECa = 0.22*SP + 0.57*SEE, Error= 0.54 , R^2 = 0.46 (5) SEE = 0.12*K + 0.15*SP + 0.25*SC, Error= 0.85 ,R^2 = 0.15 (6) CI = 0.34*SECa - 0.18*age, Error= 0.84 , R^2 = 0.16 (7) Ex = 0.44*SEE + 0.14*SC, Error= 0.75 , R^2 = 0.25	26.99	21	.17	.98	.95	.96	.98	.99

Note: (1) SC= social capital, Edu= years of education, K= knowledge, SP= social support, SECa= self-efficacy for calcium intake, SEE= self-efficacy for exercise, CI= calcium intake, Ex= exercise.

(2) GFI= Goodness-of-fit index, AGFI= Adjusted goodness-of-fit index, NFI= Normed fit index, NNFI= Non-normed fit index, CFI=Comparative fit index.

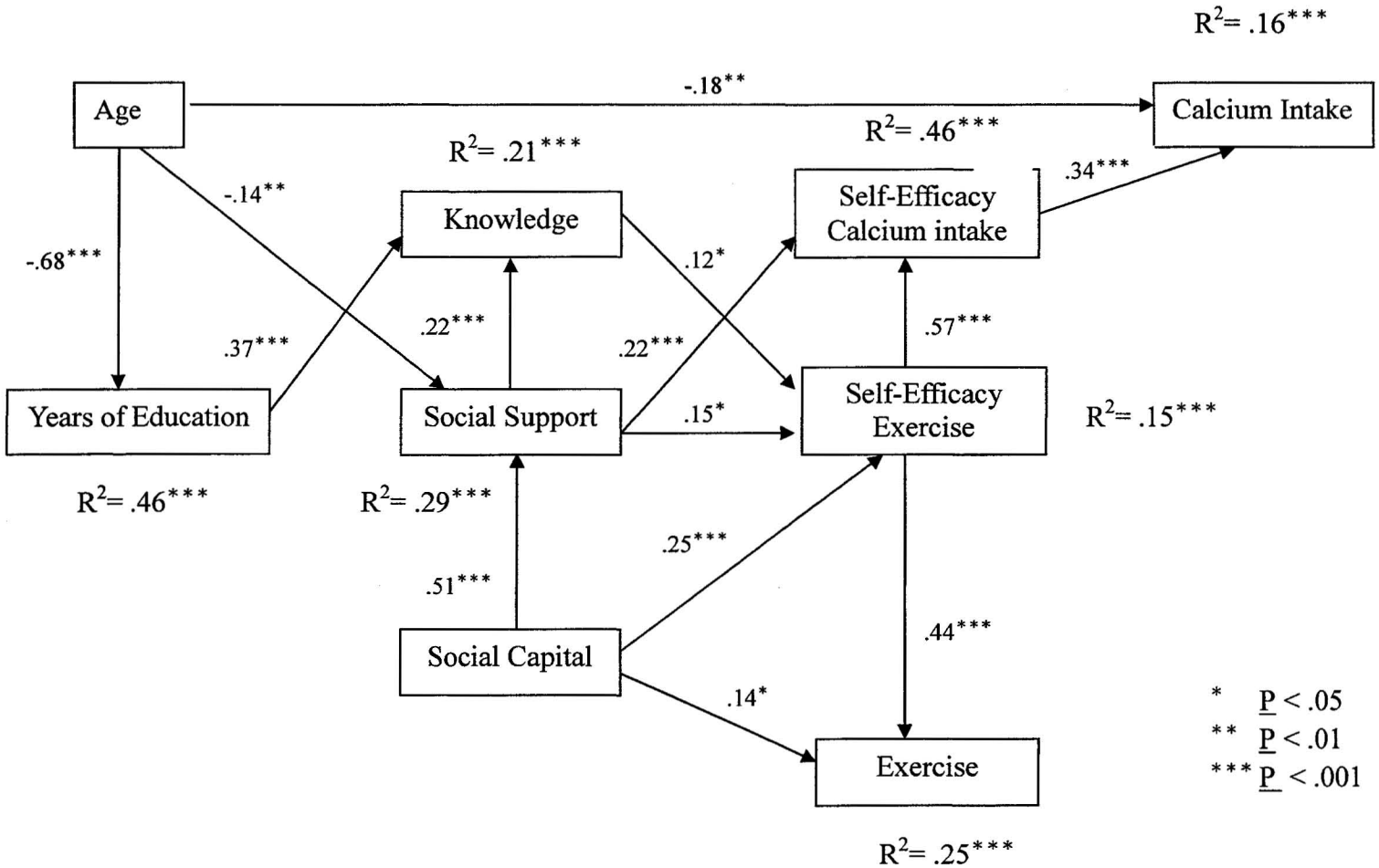


Figure 4.1 Results of a Model of Osteoporosis Preventive Behaviors Testing and Modification

The Fourth Aspect: Effects of Exogenous Variables on Endogenous Variables

The endogenous variables included calcium intake, exercise, self-efficacy for calcium intake, self-efficacy for exercise, social support, knowledge of osteoporosis, and years of education. The effects of exogenous variables on endogenous variables are described in Table 4.6.

The first endogenous variable was calcium intake. Age had both a significant direct effect on calcium intake (β=-.18, p<.01) and a significant indirect effect (β=-.02, p<.01) by way of social support, self-efficacy for calcium intake and self-efficacy for exercise (Figure 4.1). Self-efficacy for calcium intake had a significant direct effect on calcium intake (β= .34, p<.01). Social capital, social support, and self-efficacy for exercise did not have direct effects on calcium intake, but they did have a significant indirect effect on calcium intake. Social capital indirectly affected calcium intake (β= .10, p<.01) through social support, self-efficacy for calcium intake, and self-efficacy for exercise. Social support indirectly affected calcium intake (β= .11, p<.01) through knowledge of osteoporosis, self-efficacy for calcium intake, and self-efficacy for exercise. Self-efficacy for exercise had an indirect effect on calcium intake (β= .19, p<.01). In sum, age (β= -.20, p<.01), social capital (β= .10, p<.01), social support (β= .11, p<.01), self-efficacy for calcium intake (β= .34, p<.01), and self-efficacy for exercise (β= .19, p<.01) had significant total effects on calcium intake.

The second endogenous variable was exercise. Social capital had both a significant direct effect on exercise (β= .14, p<.05) and a significant indirect effect (β= .15, p<.01) by way of social support and self-efficacy for exercise. Self-efficacy for

exercise had a significant direct effect on exercise (β= .44, p<.01). Age and social support did not have direct effects on exercise, but they had a significant indirect effect on exercise. Age indirectly affected exercise (β= -.02, p<.05) through social support and self-efficacy for exercise. Social support indirectly affected exercise (β= .08, p<.05) through knowledge of osteoporosis and self-efficacy for exercise. In sum, age (β= -.02, p<.05), social capital (β= .29, p<.01), social support (β= .08, p<.05), and self-efficacy for exercise (β= .44, p<.01) had significant total effects on exercise.

The third endogenous variable was self-efficacy for calcium intake. Social support had both a significant direct effect on self-efficacy for calcium intake (β= .22, p<.01) and a significant indirect effect (β= .10, p<.05) by way of self-efficacy for exercise. Self-efficacy for exercise had a significant direct effect on self-efficacy for calcium intake (β= .57, p<.01). Age and social capital did not have direct effects on self-efficacy for calcium intake, but they had a significant indirect effect on self-efficacy for calcium intake. Age indirectly affected self-efficacy for calcium intake (β= -.06, p<.05) through years of education, knowledge of osteoporosis, social support, and self-efficacy for exercise. Social capital indirectly affected self-efficacy for calcium intake (β= .31, p<.01) through social support, knowledge of osteoporosis, and self-efficacy for exercise. In sum, age (β= -.06, p<.01), social capital (β= .31, p<.01), social support (β= .32, p<.01), and self-efficacy for exercise (β= .57, p<.01) had significant total effects on self-efficacy for calcium intake.

The fourth endogenous variable was self-efficacy for exercise. Social capital had both a significant direct effect on self-efficacy for exercise (β= .25, p<.01) and a

significant indirect effect on self-efficacy for exercise (β= .09, p<.05) by way of social support and knowledge of osteoporosis. Social support had a significant direct effect on self-efficacy for exercise (β= .15, p<.05), although it did not have a significant indirect effect (β= .03, p>.05) on self-efficacy for exercise. Knowledge of osteoporosis had a significant direct effect on self-efficacy for exercise (β= .12, p<.05). Age did not have direct effect on self-efficacy for exercise, but it had a significant indirect effect on self-efficacy for exercise (β= -.06, p<.01) through years of education, knowledge of osteoporosis, and social support. In sum, age (β= -.06, p<.01), social capital (β= .34, p<.01), social support (β= .18, p<.05), and knowledge of osteoporosis (β= .12, p<.05) had significant total effects on self-efficacy for exercise.

The fifth endogenous variable was social support. Age had a significant direct effect on social support (β= -.14, p<.01) and social capital also had a significant direct effect on social support (β= .51, p<.01).

The sixth endogenous variable was knowledge of osteoporosis. Years of education (β= .37, p<.01) and social support (β= .22, p<.01) had significant direct effect on knowledge of osteoporosis. Age (β= -.28, p<.01) had an indirect negative effect on knowledge of osteoporosis through years of education and social support. Social capital (β= .11, p<.01) had a significant indirect effect on knowledge of osteoporosis through social support. In sum, age (β= -.28, p<.01), social capital (β= .11, p<.01), social support (β= .22, p<.01), and years of education (β= .37, p<.01) had significant total effects on knowledge of osteoporosis. The last endogenous variable was years of education. Age had a direct negative effect on years of education (β= -.68, p<.01).

Table 4.6 Effects of Exogenous Variables on Endogenous Variables

Exogenous Variables	*Effects*			Endogenous Variable
	Direct	Indirect	Total	
Age	-.18**(t=-2.98)	-.02**(t=-2.59)	-.20**(t= -3.32)	CI
SC	0	.10** (t= 4.28)	.10** (t= 4.28)	
SP	0	.11** (t= 3.78)	.11** (t= 3.78)	
SECa	.34** (t= 5.62)	0	.34** (t= 5.62)	
SEE	0	.19** (t= 5.05)	.19** (t= 5.05)	
Age	0	-.02* (t= -2.49)	-.02* (t= -2.49)	Exercise
SC	.14* (t= 2.34)	.15** (t= 4.46)	.29** (t= 4.65)	
SP	0	.08* (t= 2.39)	.08* (t= 2.39)	
SEE	.44** (t=7.40)	0	.44** (t= 7.40)	
Age	0	-.06** (t= -2.92)	-.06** (t= -2.92)	SECa
SC	0	.31** (t= 6.60)	.31** (t= 6.60)	
SP	.22** (t= 4.35)	.10* (t= 2.47)	.32** (t= 5.10)	
SEE	.57** (t= 11.46)	0	.57** (t= 11.46)	
Age	0	-.06** (t= -2.64)	-.06** (t= -2.64)	SEE
SC	.25** (t= 3.53)	.09* (t= 2.44)	.34** (t= 5.59)	
K	.12* (t= 1.97)	0	.12* (t= 1.97)	
SP	.15* (t= 2.10)	.03 (t= 1.75)	.18* (t= 2.53)	
Age	-.14** (t= -2.61)	0	-.14** (t= -2.61)	SP
SC	.51** (t= 9.47)	0	.51** (t= 9.47)	
Age	0	-.28** (t= -6.28)	-.28** (t= -6.28)	K
SC	0	.11** (t= 3.49)	.11** (t= 3.49)	
Edu	.37** (t= 6.30)	0	.37** (t= 6.30)	
SP	.22** (t= 3.76)	0	.22** (t= 3.76)	
Age	-.68** (t= - 14.41)	0	-.68** (t= - 14.41)	Edu

Note: 1. Total Effect= Direct Effect + Indirect Effect 2. $t > 1.96$, * $p < .05$; $t > 2.58$, ** $p < .01$

CHAPTER 5

DISCUSSION

This discussion includes conclusion, limitations, and application in the nursing field.

Conclusion

The purposes of this study were to assess osteoporosis preventive behaviors; to examine the relationship among factors influencing osteoporosis preventive behaviors; to measure a model of factors influencing osteoporosis preventive behaviors, and to predict the direct and indirect effects of personal and social factors on osteoporosis preventive behaviors. The development of the theoretical model of factors influencing osteoporosis preventive behaviors was based on the Social Cognitive Theory and the conceptual framework for addressing the social context of health behavior. Through the use of path analysis, all the paths between exogenous variables and endogenous variables were tested.

The model of osteoporosis preventive behaviors among the Hakka of Dongshih fit the empirical data well. The output of path analysis suggested that three paths were added in the path diagram: a path from self-efficacy for exercise to self-efficacy for calcium intake; a path from social capital to self-efficacy for exercise; and a path from age to calcium intake. The following conclusions were derived from research results.

First, the resulting model (Figure 4.1) demonstrated that the personal factors and social factors directly and indirectly influenced osteoporosis preventive behaviors. It may provide guidance for the design of future nursing interventions, research and education related to osteoporosis prevention.

Second, Orem (1995) proposed that age was one of factors influencing self-care behavior. Orem's theory was supported by the result of this study: age had negative direct and indirect effect on calcium intake, indicating that the older the participant, the less the calcium intake, meaning elderly Hakka people were an osteoporosis high-risk group. Therefore, in designing nursing intervention related to osteoporosis preventive behaviors, age is one important element to be taken into account. And elderly Hakka are certainly a group deserving more attention.

Third, in Social Cognitive Theory, self-efficacy can have a significant impact on behavior change. Research result showed that self-efficacy for calcium intake and exercise affected osteoporosis preventive behaviors directly, indicating as self-efficacy improves, osteoporosis preventive behavior also improves. These findings matched the study results of Ali and Twibell (1995), Walcott-McQuigg and Prohaska (2001), and Ivers-Landis et al. (2003).

Self-efficacy beliefs are constructed from four principal sources of information including enactive mastery experiences that serve as indicators of capability; vicarious experiences that alter efficacy beliefs through transmission of competencies and comparison with the attainments of others; verbal persuasion and allied types of social influences that one possesses certain capabilities; and physiological and affective states from which people judge their capableness, strength, and vulnerability to dysfunction (p.79) (Bandura, 1997). Therefore, this study suggested that among the Hakka self-help groups might be a good way of boosting support for osteoporosis preventive behaviors. Through sharing and mutual encouragement of the participants, and via the norms and

constraints of the group, self-efficacy can be increased to improve an individual's osteoporosis preventive behaviors.

Fourth, social capital affected exercise directly in this study. This finding implied that higher social capital might increase health-promoting behavior. This is consistent with the findings of Lindstrom (2003), Drukker et al. (2003) and Crosby et al. (2003). Social capital also had direct effect on self-efficacy for exercise, and indirect effect on self-efficacy for exercise through social support. The results of this study showed that personal factors (self-efficacy), social factors (social support and social capital) and behavior interacted with and influenced each other.

Fifth, though many researchers have shown that knowledge may change one's behavior, the result of this research shows that knowledge of osteoporosis had no significant effect on calcium intake and exercise, indicating that even as knowledge of osteoporosis increases, osteoporosis preventive behavior remains the same. This result matches the research result of Terrio and Auld (2002). The degree to which knowledge affects behavior is still controversial. One argument supporting this view is that it is not necessarily true that individuals who are knowledgeable about what constitutes healthy behavior will engage in that behavior (Piaseu, Schepp, Belza, 2002). Therefore, in the future, when nursing professionals design nursing intervention strategies aimed at improving Hakka people's osteoporosis preventive behaviors, whether boosting the knowledge of osteoporosis should be a vital element of nursing practice needs to be considered.

Limitations

A number of potential limitations of this investigation should be considered.

First, due to time constraints, limited human resources and budget, convenient sampling was employed only to involve Hakka residents of Dongshih, Taiwan; the study results cannot be generalized to other ethnic groups in Taiwan. It is therefore suggested that in the future, if more time, human resources and budget are available, random sampling be employed to involve other ethnic groups and communities in Taiwan in order to increase its generalizability.

Second, in conducting research, a scale with good reliability and validity is indispensable. It is quite natural that what is readily available, researchers would decide upon a suitable and reliable scale. Yet, it is also a common occurrence that researchers cannot find a suitable scale which is developed locally, and are thus compelled to look for foreign-developed scales. For the questions and purposes of this study, three English scales were translated into Chinese versions. The three scales were the Facts on Osteoporosis Quiz (FOOQ), Osteoporosis Self-Efficacy (OSE) and Scale of Social Capital (SSC). Although the three Chinese versions turned out to have good reliability and validity in field test and formal study, convenient sampling was employed only to involve Hakka residents of Dongshih, Taiwan in this study. Therefore, it is suggested that random sampling be used to expand the study to residents in the entire Taiwan area. Also, proper parallel research instruments should be used to further establish the reliability and validity of the scale.

Third, Gau and Yeh (1999) pointed out that a testing model with goodness-of-fit

data should not be determined by the result of one single research project. Bollen (1989) also pointed out that models must be determined by cross validation; namely, researchers have to understand how a good model will be changed with the input of new data. Researchers should not regard a model with good testing results as the only suitable model, for in reality there might exist other models with equally good fit to the data. So, model-data fit is not representative of model-reality fit. Although this research project, using path analysis, found a model with goodness-of-fit data, yet model modification would be needed for different samples.

Application in the Nursing Field

Application in the nursing field, based upon the experiences derived from this study process and results, is mainly in three areas: nursing practice, nursing research, and nursing education.

Nursing practice

As the elderly population in Taiwan expands, the number of those with chronic diseases also increases. Therefore, issues related to health promotion and disease prevention are receiving more attention than ever before; at the same time, more researchers are now devoting themselves to related research. However, research targeted at health issues among the Hakka are relatively rare. To address this situation, this study focused on osteoporosis preventive behavior and its predictors among the Hakka. And the model tested in this study indicates a direction for health professionals to design appropriate interventions for the Hakka people living in Dongshih.

The results of this study indicated that Hakka people average 352.67 mg daily

calcium intake, far short of the 600 mg recommended by the Taiwan Department of Health (1993), also less than the calcium intake among the 357 working female aged 30-49 (mean= 464.83), described in Lin's (1999) study. Furthermore, as reported by the participants in this study, as they grew older, they tended to rely increasingly on dark colored vegetables for calcium intake. Based upon the data collection process, the researcher proposed two possible explanations for the low calcium intake among Hakka residents in Dongshih and their dependence on dark colored vegetables for calcium intake：

1. Dongshih is a small agricultural town, and most Hakka residents there make their living by growing fruit. Many Hakka, especially elderly people, grow vegetables in their own orchards or residence backyards. During the harvest season, aside from self consumption, they share vegetables with relatives, neighbors, and friends; that guarantees a reliable supply of dark colored vegetables; moreover, they are free. This could be one explanation for the heavy consumption of dark colored vegetables among elderly Hakka people.
2. Dongshih Hakka residents seem not to mind what they eat or whether their diet is balanced-- they just care about whether they are having enough. This dietary habit gets only more obvious as the residents in question grow older. That also helps to explain their dependence on dark colored vegetables for calcium intake.

In light of the low calcium intake among the Dongshih Hakka people, designing a nursing intervention aimed at boosting a balanced diet and improving calcium intake in order to prevent osteoporosis should be an important nursing goal in the future.

With regard to exercise, 59.67% of Dongshih Hakka people do exercise regularly. The research results show that social capital and self-efficacy for exercise are the predictors for exercise. Therefore, in designing nursing intervention to encourage exercise, social capital and self-efficacy for exercise should be considered.

In Taiwan, the Hakka is regarded as a cohesive group. Take the Hakka community in this study for example, by holding community activities such as weddings, funerals, temple events, meetings of the Mother's Class, and meetings of the Veteran Association, interpersonal interactions and clan cohesion are enhanced, as is mutual social support. And social capital is the result of social connections, norms of reciprocity, and the trust that exists in a community. The results of this study indicated that participating in community activities was correlated with social support ($r = .20$, $p < .00$) and social capital ($r = .40$, $p < .00$). It is therefore suggested that public health nurses can encourage people to participate in local community activities, and through group support, osteoporosis preventive behaviors among Hakka people can be improved.

Nursing research

According to the study results, four suggestions have put forward for future nursing research.

First, the model accounted for 16% of the variance in calcium intake and 25% of the variance in exercise, and demonstrated a good fit with the data. Much unexplained variance remained, however, and the identification of critical variables that might increase the explanatory power of the model should be an ongoing effort (Yarcheski & Mahon, 1989). The finding of Walcott-McQuigg and Prohaska's (2001) study indicated

that motivation influenced the desire and ability to exercise. Individual perceptions may impede or increase health promotion behavior (Ali & Twibell, 1995). These factors could be important focuses for future study.

Second, for the past two decades the concept of social capital has captured the interest of many researchers in different fields such as public health, medical sociology, and education. The primary reason for health care professionals' interest in this concept is that, although much work has explained various aspects of individual-level variables interacting at behavioral and physiological levels of analysis (Campbell & Jovchelovitch, 2000), there is still a critical need for empirical research into environmental variables of health. This is why this study was designed to test the relationship between social capital and exercise.

Social capital is found to have a direct effect on exercise and a significant indirect effect by way of social support and self-efficacy for exercise among Hakka people in this study; however, it is not yet clear which factors affect social capital and how social capital affects behavior. Kawachi et al. (1999) put forth five plausible pathways where social capital might influence individual and community health, including promotion of a more rapid diffusion of health information, increased likelihood that health norms or behavior are adopted, social control over unexpected health-related behavior, increased access to local services and amenities, and psychosocial processes such as affective support, self-esteem and mutual respect (Kawachi & Berkman, 2000). It is therefore suggested that a qualitative study be used to understand and study factors influencing social capital and plausible pathways where social capital might influence individual

behavior.

Third, in this study, most of the senior participants could only speak Hakka. They mentioned that since researcher also spoke Hakka, they felt close to and familiar with her; and that was why they agreed to participate in the study. This is evidence of how important language facilities to data collection. Taiwan society in recent years has seen numerous scams. If it were not for the assistance of local Hakka people who knew researcher to explain to prospective participants what the study was about and what the study meant to them, the prospective participants would likely have turned down the invitation. Therefore, it is suggested that those who wish to conduct research related to the Hakka might first seek the consent of local Hakka community members in advance. This approach would help reduce obstacles over the course of the study.

Ultimately, the prevalence of gout among residents living on the plains was 0.16%-0.67%, and 11%-15.2% among mountain aborigines. In comparison, the prevalence was 11.5% among Dongshih Hakka people, and 22.5% among male Hakka. The possible cause for this may be that it is quite common for male Dongshih Hakka to get together after a hard day's work to have some wine and peanuts, and some of them distill Chinese herbal wine by themselves; also, they do not drink enough water while working in the orchards during the daytime. It is therefore suggested that those interested in health issues related to the Hakka conduct further studies on gout related issues.

Nursing education

It might be concluded from research results that the influencing factors on Hakka

people's osteoporosis preventive behaviors include personal factors (age and self-efficacy) and social factors (social support and social capital). Yet, in Taiwan, in teaching nursing professionals and students to evaluate the factors influencing health behavior, much emphasis is placed on personal factors whereas social factors do not receive enough attention. It is therefore suggested that nurses and nursing students' knowledge about and skills in evaluating social factors should be improved, so as to design and provide effective nursing interventions and help improve patients' health behavior.

In addition, although they are a minority group in Taiwan, the Hakka people have kept their own dialect, culture, and customs. Gorrie (1989) thought that nurses' professional understanding of the meaning of health may not be sufficient when working with patients whose cultural background differs from their own. Therefore, cross-cultural nursing education programs could help to bridge cultural differences between caregivers and patients. The goal of cross-cultural education is to prepare nurses to provide sensitive, safe, beneficial, and meaningful care to people of different cultures. In light of the above, in order to improve nursing care for the Hakka people and increase their well-being, it is vital to include in nursing education knowledge about and understanding of the Hakka people.

APPENDICES

Appendix A1: Permission Letter for Using the PRQ 85-Part 2

PERMISSION TO USE THE PERSONAL RESOURCE QUESTIONNAIRE

PERMISSION TO USE THE PRQ85 and PRQ2000

IS GRANTED TO: Ching-Hsing Hsieh

THE PRQ85 IS A TWO PART INSTRUMENT . EITHER PART -1 OR PART -2 OR BOTH PARTS MAY BE ADMINISTERED. HOWEVER, NO PART OF PRQ85 OR PRQ2000 MAY BE MODIFIED WITHOUT CONSULTATION WITH THE AUTHORS.

Clarann Weinert, SC,PhD,RN,FAAN DATE: Mar 17, 2005

Appendix A2: Permission Letter for Using the PRQ 85-Part 2 (Chinese Version)

chinghsingesther@hotmail.com

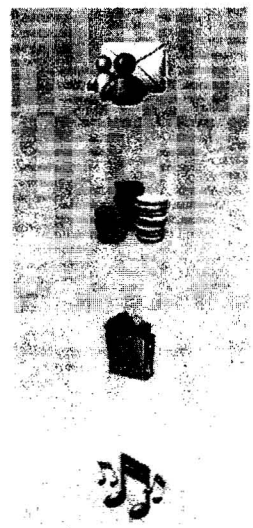
回覆 | 全部回覆 | 轉寄 | 刪除 | 垃圾郵件 | 置於資料夾 | 列印檢視 | 儲存地址

寄件者： hhwang <hhwang@kmu.edu.tw> | 收件匣

日期： 2005年4月11日 2:49:13

收件者： "chang esther" <chinghsingesther@hotmail.com>

主旨： Re: 量表同意書



學姐您好：

附件為量表檔案，
請查收。

助理 馬莉 敬上

----- Original Message -----
From: chang esther
To: hhwang@kmu.edu.tw
Sent: Sunday, April 10, 2005 10:47 PM
Subject: 量表同意書

教授您好：

我是University of Hawaii at Manoa護理博士班的學生。我的博士論文將會調查客家人的社會支持，並決定使用The Personal Resource Questionnaire 85- part 2 (Weinert, 1987)於我的研究中。

原作者 Dr. Weinert已同意讓我使用此量表。在文獻查證的過程中得知，您已於 1998將 The Personal Resource Questionnaire 85- part 2 翻譯成中文。請問您是否同意讓我使用您翻譯的中文版個人資源問卷表於我的研究中嗎？謝謝！

謝金杏 敬上

Appendix B: Permission Letter for Using the OSES-12

GRAND VALLEY STATE UNIVERSITY
www.gvsu.edu

March 7, 2005

Ching H Hsieh
1441 Victoria St Apt 1204
Honolulu, HI 96822

Dear Ching H Hsieh,

Thank you for your interest in the Osteoporosis Health Belief Scale (OHBS), Osteoporosis Knowledge Test (OKT), Osteoporosis Self-Efficacy Scale-21(OSES) and Osteoporosis Self-Efficacy Scale-12 (OSES). You have my permission to use the instruments. Please keep us informed of any publications and/or presentations and send us an abstract or summarize your study results when completed.

I wish you much success with your study.

Sincerely,

Phyllis Gendler, PhD, APRN, BC, NP
Professor and Dean
Cook-DeVos Center for Health Science
Kirkhof College of Nursing
Grand Valley State University
301 Michigan St. NE
Grand Rapids, MI 49503

Phone: 616-331-7161
Fax: 616-331-7362
E-mail: gendlerp@gvsu.edu

Appendix C: Permission Letter for Using the FOOQ

From railinge@gmu.edu Add Sender
Sent Tuesday, April 5, 2005 4:46 am
To hsiehc@hawaii.edu
Subject FOOQ instrument
Attachments FOOQ01 F03.doc 1.1MB FOOQ Answer F03.doc 15K

Dear Ms. Hsieh:

Thank you for your interest in the Facts on Osteoporosis Quiz. I have attached to this message the quiz and the answers. Subject to the restraints specified below, you have permission to use the quiz in your research.

The copyright must appear on the printed copies of the instrument. The instrument will, of course, need to be appropriately reference in any published work. At this time there is no charge for the tool. In return for using the quiz, we ask that you send us copies of any publications citing the use of the quiz.

Please let me know by return email if you agree to these conditions and decide to use the FOOQ instrument. Also, please send me your complete address.

Sincerely,

Rita L. Allinger, PhD,RN
Professor and Director of Nursing Research Development
College of Nursing and Health Science
George Mason University
Fairfax, VA 22030-4444
(703) 993-1926
Fax: (703) 993-1942

Appendix D: Permission Letter for Using the SCQ

From Paul Bullen <paul.bullen@mapl.com.au> Add Sender

Sent Tuesday, March 1, 2005 8:16 pm

To Ching H Hsieh <hsiehc@hawaii.edu>

Subject Re: Questionnaire

Ching-Hsing

You are most welcome to translate and use the questionnaire. I am not aware of any translations into Chinese. I would be interested in hearing about your results when they become available.

Paul

Ching H Hsieh wrote:

> Dear Professor Bullen:
> I am a PhD student in the University of Hawaii at Manoa School of
> Nursing. I plan to do my dissertation about social capital among
> Taiwanese.....

--

Paul Bullen
Management Alternatives Pty Ltd
PO Box 181, Coogee, NSW, 2034
Australia

Phone: (02) 9665 7737
Fax: (02) 9315 7542

web page: www.mapl.com.au
email: paul.bullen@mapl.com.au

Appendix E: Permission Letter for Using the SCI

chinghsingesther@hotmail.com

寄件者： anne <anne@mail.cgu.edu.tw> | | 收件匣

日期： 2005年4月13日 10:35:28

收件者： <chinghsingesther@hotmail.com>

主旨： Re: 量表同意書

謝小姐您好：

我很樂意讓您使用我所發展的量表，但我認為它仍不盡完善，請您慎重考慮如何引用。

祝福您研究順利！

林雲萍敬上

-------*Original Message*-------

從: chang esther

日期: Monday, April 11, 2005 09:08:46

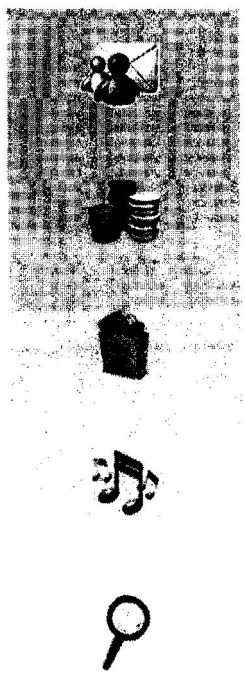
至: anne@mail.cgu.edu.tw

主題: 量表同意書

林雲萍老師您好:

我是University of Hawaii at Manoa的護理博士班的學生。我欲研究台中縣居民的骨質疏鬆症預防行為，因此想使用您所發展的「攝鈣及運動行為量表」（1999）於我的研究中。不知您是否同意讓我使用它？謝謝！

謝金杏 敬上



Appendix F: Permission Letter for Using the PAQ

From "Prof. Jean woo" <jeanwoowong@cuhk.edu.hk> Add Sender
Sent Monday, May 9, 2005 8:48 pm
To Ching H Hsieh <hsiehc@hawaii.edu>
Subject Re: Questionnaire

Dear Ching-Hsing
You have permission to use the questionnaire.I shall ask my research assistant to send you a copy.
Jean woo
At 11:29 AM 5/10/2005, you wrote:

> Dear Professor Woo:
> I am a PhD student in the University of Hawaii at Manoa School of Nursing. I plan to do my dissertation about physical activities among Taiwanese. I am very interested in the Chinese-version Physical Activity Questionnaire that you have developed and have used in your study (2001). If appropriate, I hope I can have this Chinese-version instrument and receive your permission to use it in my study. Thank you very much!
>
> Best regards,
> Ching-Hsing HSIEH

Professor Jean Woo MD FRCP FRACP FFPH
Chair Professor of Medicine
Chairman, Department of Community and Family Medicine
Head, Division of Geriatric Medicine, Department of Medicine & Therapeutics
Hon Chief of Service (G), Shatin Hospital
The Chinese University of Hong Kong
Tel 22528763, 26323493
Fax 26063500, 26373852
email jeanwoowong@cuhk.edu.hk

Appendix G1: The Personal Resource Questionnaire 85- Part 2

Directions: Below are some statements with which some people agree and others disagree. Please read each statement and **CIRCLE** the response most appropriate for you. There is no right or wrong answer.

1= strongly disagree
2= disagree
3= somewhat disagree
4= neutral
5= somewhat agree
6= agree
7=strongly agree

a. There is someone I feel close to who makes me feel secure.	1 2 3 4 5 6 7
b. I belong to a group in which I feel important.	1 2 3 4 5 6 7
c. People let me know that I do well at my work (job, homemaking).	1 2 3 4 5 6 7
d. I can't count on my relatives and friends to help me with problems.	1 2 3 4 5 6 7
e. I have enough contact with the person who makes me feel special.	1 2 3 4 5 6 7
f. I spend time with others who have the same interests that I do.	1 2 3 4 5 6 7
g. There is little opportunity in my life to be giving and caring to another person.	1 2 3 4 5 6 7
h. Others let me know that they enjoy working with me (job, committees, projects).	1 2 3 4 5 6 7
i. There are people who are available if I need help over an extended period of time.	1 2 3 4 5 6 7
j. There is no one to talk to about how I am feeling.	1 2 3 4 5 6 7
k. Among my group of friends we do favors for each other.	1 2 3 4 5 6 7
l. I have the opportunity to encourage other to develop their interests and skills.	1 2 3 4 5 6 7
m. My family lets me know that I am important for keeping the family running.	1 2 3 4 5 6 7
n. I have relatives or friends that will help me out even if I can't pay them back.	1 2 3 4 5 6 7

o. When I am upset, there is someone I can be with who lets me be myself.	1 2 3 4 5 6 7
p. I know that others appreciate me as a person.	1 2 3 4 5 6 7
q. I enjoy doing little "extra" things that make another person's life more pleasant.	1 2 3 4 5 6 7
r. I know that others appreciate me as a person.	1 2 3 4 5 6 7
s. There is someone who loves and cares about me.	1 2 3 4 5 6 7
t. I have people to share social events and fun activities with.	1 2 3 4 5 6 7
u. I am responsible for helping provide for another person's needs.	1 2 3 4 5 6 7
v. If I need advice there is someone who would assist me to work out a plan for dealing with the situation.	1 2 3 4 5 6 7
w. I have a sense of being needed by another person.	1 2 3 4 5 6 7
x. People think that I'm not as good a friend as I should be.	1 2 3 4 5 6 7
y. If I got sick, there is someone to give me advice about caring for myself.	1 2 3 4 5 6 7

Appendix G2: The Personal Resource Questionnaire 85- Part 2 (Chinese Version)

個人資源問卷表

說 明:以下這些敘述,有些人同意這樣的說法,有些人則不同意. 任何一個敘述都沒有"對" 或 "錯" 的答案。請在每個敘述上簽選一個您認爲最適合的答案。

1 = 非常不同意　2 = 不同意　3 = 有一點點不同意　4 = 沒意見

5 = 有一點點同意　6 = 同意　7 = 非常同意

a. 我有親近的人而且他們讓我覺得可以依靠.....1 2 3 4 5 6 7

b. 我和別人在一起的團體中,我感覺自己是重要的.....1 2 3 4 5 6 7

c. 別人認爲我將份內的工作做得很好(例如工作, 家事).....1 2 3 4 5 6 7

d. 我無法依靠我的親戚或朋友幫助我解決困難.....1 2 3 4 5 6 7

e. 我會常常和讓我感到自己是特別的人在一起.....1 2 3 4 5 6 7

f. 我會找時間與和我有相同興趣的人在一起.....1 2 3 4 5 6 7

g. 在我的生活中很少有機會幫助或照顧別人.....1 2 3 4 5 6 7

h. 有人告訴我他們喜歡和我一起做事.....1 2 3 4 5 6 7

i. 假如我需要一段長時間的幫忙, 我可以找到人來幫助我.....1 2 3 4 5 6 7

j. 沒有人可以和我討論我的感受..... 1 2 3 4 5 6 7

k. 我和朋友之間會互相幫忙.....1 2 3 4 5 6 7

l. 我會鼓勵別人發展他們的興趣和技能.....1 2 3 4 5 6 7

m. 我的家人認爲我對維持家庭生活的運作很重要.....1 2 3 4 5 6 7

n. 我有一些親戚或朋友會願意無條件幫助我.....1 2 3 4 5 6 7

o. 當我心情不好時有人可以和我在一起而且讓我感到很自在.....1 2 3 4 5 6 7

p. 我覺得我遇到的問題都和別人很不一樣.....1 2 3 4 5 6 7

q. 我歡喜做一些特別的事讓別人更加快樂 1 2 3 4 5 6 7

r. 我感到有人欣賞我.....1 2 3 4 5 6 7

s. 有人很關心我..... 1 2 3 4 5 6 7

t. 有人可以和我分享一些社會上發生的事情和生活上有趣味的事.....1 2 3 4 5 6 7

u. 我應該幫助別人的需要..... 1 2 3 4 5 6 7

v. 假如我需要建議時,有人會提供我意見而且幫助我處理這件事情.....1 2 3 4 5 6 7

w. 我覺得別人需要我.....1 2 3 4 5 6 7

x. 別人認爲我沒有做到一個朋友(或鄰居)應該做的那樣好.....1 2 3 4 5 6 7

y. 假如我生病了, 有人會給我意見教我如何照顧我自己.....1 2 3 4 5 6 7

Appendix H1: The Osteoporosis Self-Efficacy Scale-12

Place your "X" anywhere on the answer line that you feel best describes your confidence level.

If it were recommended that you do any of the following THIS WEEK, how confidence or certain would you be that you could:

1. began a new or different exercise program

Not at all confident |——————————————————| Very confident

2. change your exercise habits

Not at all confident |——————————————————| Very confident

3. put fourth the effort required to exercise

Not at all confident |——————————————————| Very confident

4. do exercise even if they are difficult

Not at all confident |——————————————————| Very confident

5. exercise for the appropriate length of time

Not at all confident |——————————————————| Very confident

6. do the type of exercise that you are supposed to do

Not at all confident |——————————————————| Very confident

If it were recommended that you do any of the following THIS WEEK, how cofident or certain would you be that you could:

7. increase your calcium intake

Not at all confident |——————————————————| Very confident

8. change your diet to include more calcium rich foods

Not at all confident |——————————————————| Very confident

9. eat calcium rich foods as often as you are supposed to do

Not at all confident ——— Very confident

10. select appropriate foods to increase your calcium intake

Not at all confident ——— Very confident

11. stick to a diet which gives an adequate amount of calcium

Not at all confident ——— Very confident

12. obtain foods that give an adequate amount of calcium even when they are not readily available

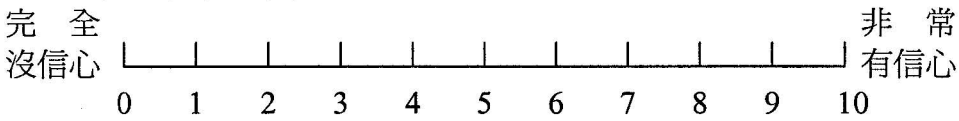
Not at all confident ——— Very confident

Appendix H2: The Osteoporosis Self-Efficacy Scale-12 (Chinese Version)

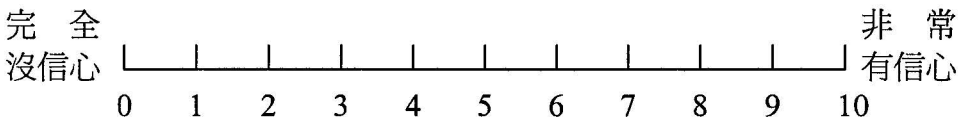
下列問題請根據您的信心程度圈選適當的數字：0 代表「完全沒信心」；10 代表「非常有信心」。

如果有人建議您*這星期*從事下列所描述的事情，請問您對自己有多少信心去做這些事情:

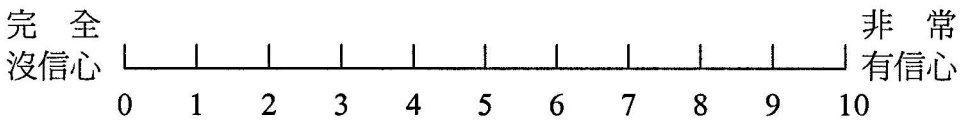
1. 開始做新的或是不同的運動



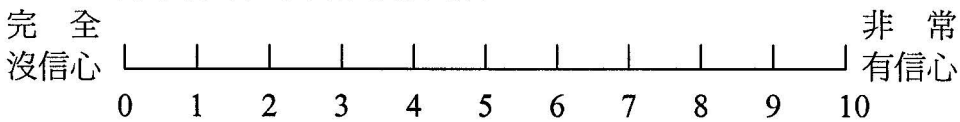
2. 改變您的運動習慣



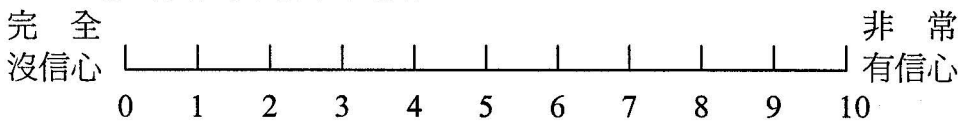
3. 開始努力地去做運動



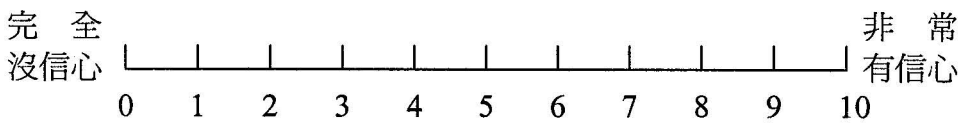
4. 即使是很難的運動也會去做



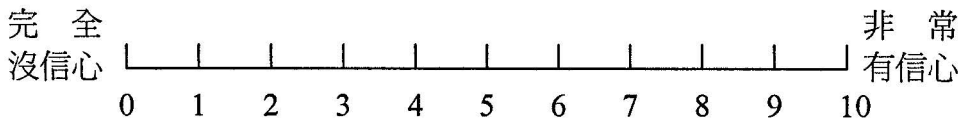
5. 做時間長度適當的運動



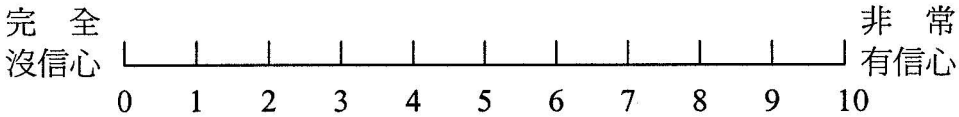
6. 從事您應該做的運動項目



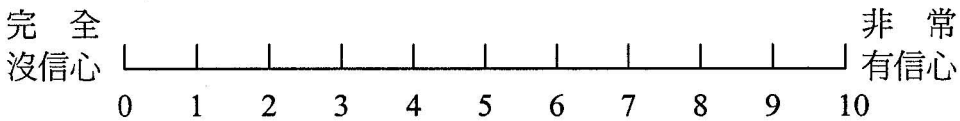
7. 增加您的鈣質攝取量



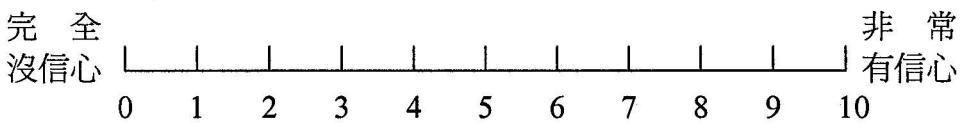
8. 改變您的飲食以攝取含鈣質豐富的食物



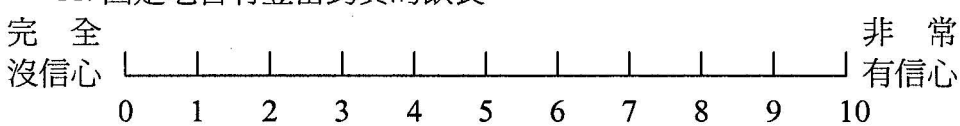
9. 經常攝取您應該要吃的含鈣豐富的食物



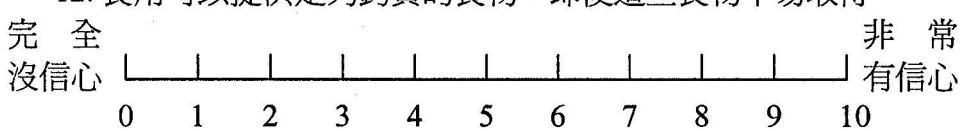
10. 選擇適當的食物以增加您的鈣質攝取量



11. 固定吃含有豐富鈣質的飲食



12. 食用可以提供足夠鈣質的食物，即使這些食物不易取得



Appendix I1: The Facts on Osteoporosis Quiz

		True	False	Don't know
1	Physical activity increases the risk of osteoporosis.	1	2	3
2	High impact exercise (weight training) improves bone health.	1	2	3
3	Most people gain bone mass after 30 years of age.	1	2	3
4	Low weight women have osteoporosis more than heavy women.	1	2	3
5	Alcoholism is not linked to the occurrence of osteoporosis.	1	2	3
6	The most important time to build bone strength is between 9 and 17 years of age.	1	2	3
7	Normally, bone loss speeds up after menopause.	1	2	3
8	High caffeine combined with low calcium intake increases the risk of osteoporosis.	1	2	3
9	There are many ways to prevent osteoporosis.	1	2	3
10	Without preventive measures 20% of women older than 50 years will have a fracture due to osteoporosis in their lifetime.	1	2	3
11	There are treatments for osteoporosis after it develops.	1	2	3
12	A lifetime of low intake of calcium and vitamin D does not increase the risk of osteoporosis.	1	2	3
13	Smoking does not increase the risk of osteoporosis.	1	2	3
14	Walking has a great effect on bone health.	1	2	3
15	After menopause, women not on estrogen need about 1500 mg of calcium (for example, 5 glasses of milk) daily.	1	2	3
16	Osteoporosis affects men and women.	1	2	3
17	Early menopause is not a risk factor for osteoporosis.	1	2	3
18	Replacing hormones after menopause cannot slow down bone loss.	1	2	3
19	Children 9 to 17 years of age get enough calcium from one glass of milk each day to prevent osteoporosis.	1	2	3
20	Family history of osteoporosis is not a risk factor for osteoporosis.	1	2	3

Appendix I2: The Facts on Osteoporosis Quiz (Chinese Version)

		對	錯	不知道
1	身體活動會增加骨質疏鬆症的發生機率。	1	2	3
2	高衝擊運動(負重運動，例如跑步)可以提高骨頭的健康。	1	2	3
3	過了三十歲，大多數的人骨質會增加。	1	2	3
4	體重輕的女性比體重重的女性有較多的骨質疏鬆情況。	1	2	3
5	酗酒與骨質疏鬆症無關。	1	2	3
6	9到17歲是建立骨質強度最重要的年齡。	1	2	3
7	正常情況下，更年期過後骨質流失的速度會加快。	1	2	3
8	攝取過多的咖啡因加上鈣質攝取不足會增加骨質疏鬆的發生機率。	1	2	3
9	有很多的方法可以預防骨質疏鬆。	1	2	3
10	如果沒有採取預防措施，有20%五十歲以上的婦女在她們的一生中，會因爲骨質疏鬆症而引起骨折。	1	2	3
11	骨質疏鬆症發生之後是有方法可以治療的。	1	2	3
12	長期的鈣質與維生素D攝取不足不會增加骨質疏鬆的發生機率。	1	2	3
13	抽菸不會增加骨質疏鬆症的發生機率。	1	2	3
14	走路對骨質健康有很大的影響。	1	2	3
15	更年期過後，女性缺少黃體素（一種女性荷爾蒙）因此每天應該要攝取1500毫克的鈣質(例如，五杯牛奶)。	1	2	3
16	骨質疏鬆症會發生在男性與女性。	1	2	3
17	更年期來的早並不是導致骨質疏鬆症的危險因素。	1	2	3
18	更年期過後補充荷爾蒙不能減緩骨質的流失。	1	2	3
19	爲了預防骨質疏鬆症，9到17歲的兒童每天喝一杯牛奶補充鈣質就足夠了。	1	2	3
20	有骨質疏鬆症的家族史並不是導致骨質疏鬆症的危險因素。	1	2	3

Appendix J1: The Scale of Social Capital

In the following questions please circle the most appropriate response 1, 2, 3 or 4

1. Do you feel valued by society?
   No, not much 1 2 3 4 *Yes, very much*
2. If you were to die tomorrow, would you be satisfied with what your life has meant?
   No, not much 1 2 3 4 *Yes, very much*
3. Have you ever picked up other people's rubbish in a public place?
   No, never 1 2 3 4 *Yes, frequently*
4. Some say that by helping others you help yourself in the long run. Do you agree?
   No, not much 1 2 3 4 *Yes, very much*
5. Do you help out a local group as a volunteer?
   No, not at all 1 2 3 4 *Yes, often (at least once a week)*
6. Do you feel safe walking down your street after dark?
   No, not much 1 2 3 4 *Yes, very much*
7. Do you agree that most people can be trusted?
   No, not much 1 2 3 4 *Yes, very much*
8. If someone's car breaks down outside your house, do you invite them into your home to use the phone?
   No, not at all 1 2 3 4 *Yes, definitely*
9. Can you get help from friends when you need it?
   No, not at all 1 2 3 4 *Yes, definitely*
10. Does your area have a reputation for being a safe place?
    No, not at all 1 2 3 4 *Yes, definitely*
11. If you were caring for a child and needed to go out for a while, would you ask a neighbour or help?
    No, not at all 1 2 3 4 *Yes, definitely*
12. Have you visited a neighbour in the past week?
    No, not at all 1 2 3 4 *Yes, definitely*
13. Have you attended a local community event in the past 6 months (eg, church fete, school concert, craft exhibition)?
    No, not at all 1 2 3 4 *Yes, several (at least 3)*
14. Are you an active member of a local organization or club (eg, sport, craft, social club)?
    No, not at all 1 2 3 4 *Yes, very active*
15. Does your local community feel like home?
    No, not at all 1 2 3 4 *Yes, definitely*

16. In the past week, how many phone conversations have you had with friends?

None *Many (at least 6)*

1 2 3 4

17. How many people did you talk to yesterday?

No, not at all *Many (at least 10)*

1 2 3 4

18. Over the weekend do you have lunch/dinner with other people outside your household?

No, not much *Yes, nearly always*

1 2 3 4

19. Do you go outside your local community to visit your family?

No, not much *Yes, nearly always*

1 2 3 4

20. When you go shopping in your local area are you likely to run into friends and acquaintances?

No, not much *Yes, nearly always*

1 2 3 4

21. If you need information to make a life decision, do you know where to find that information?

No, not at all *Yes, definitely*

1 2 3 4

22. In the past 6 months, have you done a favour for a sick neighbour?

No, not at all *Yes, frequently (at least 5 times)*

1 2 3 4

23. Are you on a management committee or organizing committee for any local group or organisation?

No, not much *Yes, several (at least 3)*

1 2 3 4

24. In the past 3 years, have you ever joined a local community action to deal with an emergency?

No, not at all *Yes, frequently (at least 5 times)*

1 2 3 4

25. In the past 3 years have you ever taken part in a local community project or working bee?

No, not at all *Yes, very much*

1 2 3 4

26. Have you ever been part of a project to organise a new service in your area (eg, youth club, scout hall, child care, recreation for disabled)?

No, not at all *Yes, several times (at least 3)*

1 2 3 4

27. If you disagree with what everyone else agreed on, would you feel free to speak out?

No, not at all *Yes, definitely*

1 2 3 4

28. If you have a dispute with your neighbours (eg, over fences or dogs) are you willing to seek mediation?

No, not at all *Yes, definitely*

1 2 3 4

29. Do you think that multiculturalism makes life in your area better?

No, not at all *Yes, definitely*

1 2 3 4

30. Do you enjoy living among people of different life styles?

No, not at all *Yes, definitely*

1 2 3 4

31. If a stranger, someone different, moves into your street, would they be accepted by the neighboyrs?

No, not easily *Yes, definitely*

1 2 3 4

Appendix J2: The Scale Social Capital (Chinese Version)

下列問題請圈選您認爲最適當的答案 1,2,3 或 4

1. 您覺得有被社會所重視嗎?
   1. 沒有　2. 很少　3. 經常　4. 很多
2. 如果明天您將離開這個人世間 ，您對這輩子的生命意義感到滿意嗎？
   1. 不滿意　2. 很少　3. 經常　4. 很滿意
3. 請問您在公共場所中撿過別人丟的垃圾嗎？
   1. 從來沒有　2. 很少　3. 經常　4. 總是如此
4. 有些人說：長遠來說，幫助別人就是幫助自己。您同意這句話嗎？
   1. 完全不同意　2. 不同意　3. 同意　4. 完全同意
5. 您有在當地的社團中擔任義工嗎？
   1. 從來沒有　2. 很少　3. 偶爾　4. 常常（最少一星期一次）
6. 晚上您走在街上，您覺得安全嗎？
   1. 非常不安全　2. 不安全　3. 安全　4. 非常安全
7. 您同意「大多數的人是可以被信任」的嗎？
   1. 完全不同意　2. 不同意　3. 同意　4. 完全同意
8. 假如有人的車子在您家們口拋錨了，您會邀請他去你家打通電話嗎？
   1. 完全不會　2. 不會　3. 會　4. 一定會
9. 當您需要幫助時，您可以從您的朋友那裡得到幫助嗎？
   1. 完全不會　2. 不會　3. 會　4. 一定會
10. 您住的地方是被大家認爲安全的地方嗎？
    1. 非常不安全　2. 不安全　3. 安全　4. 非常安全
11. 假如您現在正在照顧小孩，但是需要出門一會兒，您會請鄰居幫忙嗎？
    1. 完全不會　2. 不會　3. 會　4. 一定會
12. 過去這一個星期，您有去鄰居家拜訪嗎？
    1. 從來沒有　2. 很少　3. 經常　4. 總是如此
13. 過去這六個月，您有參加當地社區的活動嗎？(例如：婚禮、喪禮、大拜拜或是廟會活動)
    1. 從來沒有　2. 很少　3. 偶爾　4. 常常（最少 3 次）
14. 請問您是任何社團或是團體的活躍成員嗎？
    1. 不是　2. 還好　3. 活躍　4. 非常活躍
15. 您所居住的社區像是您的家嗎？
    1. 完全不像　2. 不像　3. 像　4. 非常像
16. 過去的一週，有多少次您用電話與朋友聊天？
    1. 完全沒有　2. 很少　3. 偶爾　4. 很多（最少 6 次）
17. 昨天您與多少人說話？
    1. 完全沒有　2. 很少　3. 偶爾　4. 很多（最少 10 個人）

18. 週末時，您會與家人以外的人一同吃午餐或晚餐嗎？
1. 完全沒有　2. 很少　3. 偶爾　4. 總是如此

19. 您會到社區以外的其他地方拜訪家人嗎？
1. 完全沒有　2. 很少　3. 偶爾　4. 總是如此

20. 您在當地逛街時，常會碰到朋友或熟人嗎？
1. 完全沒有　2. 很少　3. 偶爾　4. 總是如此

21. 當您需要資訊以協助您做一個跟您的生命有關的決定時，您知道哪裡可以得到您需要的資訊嗎？
1. 完全不知道　2. 不知道　3. 知道　4. 當然知道

22. 過去的六個月，您幫助過生病的鄰居嗎？
1. 完全沒有　2. 很少　3. 偶爾　4. 總是如此（最少 5 次）

23. 您是任何社團或是團體的管理委員會委員或是組織委員嗎？
1. 完全沒有　2. 很少　3. 偶爾　4. 總是如此（最少 3 個）

24. 過去三年裏，您曾經參與處理社區裏的急難救助事件嗎？
1. 完全沒有　2. 很少　3. 偶爾　4. 總是如此（最少 5 次）

25. 過去三年裏，您曾經參與社區計畫或是團隊活動嗎？
1. 完全沒有　2. 很少　3. 偶爾　4. 很多

26. 您曾參與規畫當地社區新的服務嗎?（如：青少年社團、育幼院、殘障休閒中心）
1. 完全沒有　2. 很少　3. 偶爾　4. 總是如此（最少 3 次）

27. 如果您的意見與眾人不同時，您會很自在的將它說出來嗎？
1. 完全沒有　2. 很少　3. 偶爾　4. 總是如此

28. 如果您與鄰居發生衝突時，您會想要尋求調解嗎？
1. 完全沒有　2. 很少　3. 偶爾　4. 總是如此

29. 您認爲多元文化使您生活的環境變的更好嗎？
1. 完全不同意　2. 不同意　3. 同意　4. 完全同意

30. 您喜歡與不同生活型態的人相處嗎？
1. 完全不喜歡　2. 不喜歡　3. 喜歡　4. 非常喜歡

31. 假如一個跟你不一樣的陌生人搬到你家巷子，他們能被鄰居們接受嗎？
1. 完全不能　2. 不能　3. 可以　4. 完全沒問題

Appendix K1: The Scale of Calcium Intake

Did you eat the following food last week often? Please mark, based on the real situation, how many times do you have it every week and how much do you have it every time respectively.

	Frequency and amount of calcium intake / Name and unit of food	How many times per week					How much					
		None	1 -2 times	3-4 times	5-6 times	Every day	None	1/3 unit or less	1/2unit	One unit	11/2 unit	2 units and more
		1	2	3	4	5	0	1	2	3	4	5
1	Milk (1 box or 1 glass/ a unit)(240 cc)											
2	Yogurt (1 small bottle/ a unit)(200 cc)											
3	Cheese (1 piece/ a unit)											
4	Tofu (1pack/ a unit)											
5	Dry tofu (2 pieces/ a unit)											
6	Small dry fish (1 spoon/ a unit)											
7	Kelp (1/2 bowl/ a unit)											
8	Beans (1/2 bowl/ a unit)											
9	Dark colored vegetables(1/2 bowl/ a unit)											

Explanations:

Beans include peanut, kidney bean, soybean, red bean, green bean, lotus, and soy bean.

Dark colored vegetables include sweet potato leaf, leaf mustard, Chinese broccoli, water spinach, rape, amaranth, Chinese cabbage.

It can be counted as long as you have eaten any kind of the food listed above.

Appendix K2: The Scale of Calcium Intake (Chinese Version)

過去這一星期，您是否經常吃下列食物？請分別於「多久吃一次」及「每次食用量」按實際情形打 V。

食用頻率與食用量 / 食物名稱與單位		多久吃一次					每次食用量					
		幾乎沒吃	每週一至二次	每週三至四次	每週五至六次	每天一次以上	沒吃	1/3份或更少	半份	一份	一份半	二份以上
		1	2	3	4	5	0	1	2	3	4	5
1	牛奶 (一小盒或一杯/份)(240 cc)											
2	優酪乳 (一小瓶/份)(200 cc)											
3	乳酪（起司）(一片/份)											
4	豆腐 (一塊四方格/份)											
5	豆乾(二塊/份)											
6	小魚干、吻仔魚 (一湯匙/份)											
7	海帶 (飯碗半碗/份)											
8	豆類食物 (飯碗半碗/份)											
9	深色蔬菜 (飯碗半碗/份)											

說明：

豆類食物是指花生、蓮子、花豆、黃豆、紅豆、綠豆(非綠豆仁)、毛豆。

深色蔬菜是指九層塔、地瓜葉、芥菜、芥藍菜、空心菜、油菜、青江菜、紅鳳菜、紅莧菜、莧菜、雪裡紅、小白菜、梅乾菜。

只要您有吃上列各種食物之其中一種，就可算在內。

Appendix L1: Physical Activity Questionnaire

Please tell me which of them you did during the last week and for each activity you do, please tell me how much time (hours) you spent in that activity each time. (NB If the last week isn't a typical week for you, please use a usual week as reference.)

Example:

If I swim 2 times a week and 1 hour each time (excluding changing clothes), I should record like this:

		Duration for each time (h)	Frequency per week (times/week)
V	Swimming	1 h	2 times

Research use only

	Hour (s) Spent for each time	Frequency per week	Intensity code (kcal/min)	
Exercise (NB excluding times for changing clothes)				
1. Brisk walk (+10 min)	_____ h	___ times	6.0	Di Pietro et al., 1993
2. Stretching exercise. Yoga; Tai-qi; Qi Kung; stretching	_____ h	___ times	3.0	Di Pietro et al., 1993
3. Vigorous calisthenics, aerobics	_____ h	___ times	6.0	Di Pietro et al., 1993
4. Dancing (mod/fast): ballroom, Chinese dancing	_____ h	___ times	5.5	Di Pietro et al., 1993
5. Bowling	_____ h	___ times	3.0	Taylor et al., 1978
6. Ping Pong	_____ h	___ times	4.0	Taylor et al., 1978
7. Racquet sports: tennis, racquet ball	_____ h	___ times	7.0	Taylor et al., 1978
8. Golf	_____ h	___ times	5.0	Di Pietro et al., 1993
9. Bocci	_____ h	___ times	2.5	Di Pietro et al., 1993
10. Cycling, exercise	_____ h	___ times	6.0	McArdle et al., 1991
11. Swimming	_____ h	___ times	6.0	Di Pietro et al., 1993
12. Volley ball	_____ h	___ times	4.0	Taylor et al., 1978
13. Basketball	_____ h	___ times	7.0	Taylor et al., 1978
14. Football	_____ h	___ times	8.0	McArdle et al., 1991
15. Squash	_____ h	___ times	11.4	Taylor et al., 1978
16. Others (pls. specify)	_____ h	___ times		
			Subtotal	

Appendix L2: Physical Activity Questionnaire (Chinese Version)

《日常活動問卷調查》

請在過去一星期內曾做過的運動旁加上 "√" 號，並填上你一星期用多少時間在該活動上。（註：如果過去那星期內因爲任何原因，你所作的活動比平常多或者少，請以一個與你日常活動最接近的星期爲準作答。）

例一：如果我每星期有 2 天會游泳，每次 1 小時(注意這 1 小時不包括換衣服)，我應如下填寫：

		每次 用多少小時	*一星期* 有多少次
√	游泳	*1 小時*	*2 次*

此欄由調查員填寫

		每次 用多少小時	*平均一星期* 有多少次	內碼 (熱量/分鐘)		
	運動（注意不包括運動前後更換衣服的時間）					
__	1. 以較快速度步行(維持十分鐘以上)	_____ 小時	_____ 次	6.0	____	_____
__	2. 伸展手腳、瑜珈、太極、氣功早操、柔軟體操	_____ 小時	_____ 次	3.0	____	_____
__	3. 較劇列運動如:健康舞、健身	_____ 小時	_____ 次	6.0	____	_____
__	4. 跳舞: 社交舞、中國舞	_____ 小時	_____ 次	5.5	____	_____
__	5. 保齡球	_____ 小時	_____ 次	3.0	____	_____
__	6. 乒乓波	_____ 小時	_____ 次	4.0	____	_____
__	7. 網球、羽毛球	_____ 小時	_____ 次	7.0	____	_____
__	8. 哥爾夫球	_____ 小時	_____ 次	5.0	____	_____
__	9. 卓球、康樂棋	_____ 小時	_____ 次	2.5	____	_____
__	10. 踏單車	_____ 小時	_____ 次	6.0	____	_____
__	11. 游泳	_____ 小時	_____ 次	6.0	____	_____
__	12. 排球	_____ 小時	_____ 次	4.0	____	_____
__	13. 籃球	_____ 小時	_____ 次	7.0	____	_____
__	14. 足球	_____ 小時	_____ 次	8.0	____	_____
__	15. 壁球	_____ 小時	_____ 次	11.4	____	_____
__	16. 其他 _____	_____ 小時	_____ 次		____	_____
				總和 ：	_____	

Appendix M1: Demographic Questionnaire

1. Birth date:_____(month) _____ (year)

2. Gender: ☐Female ☐Male

3. How long have you lived in Dungshih? _____Years

4. Do you participant in any community activities? ☐ No ☐Yes

5. Level of education:

☐Illiteracy ☐Literacy, no formal education

☐Elementary school (1-6 years) ☐Junior high school (7-9 years)

☐Senior high school (10-12 years) ☐ College and above (more than 13 years)

6. Years of school completed: _____Years

7. Marital status:

☐Unmarried (If you chose this answer, please answer Question 9 directly)

☐Married, living with spouse ☐Married, widow

☐Divorced or Separated ☐Other

8. Spouse's level of education:

☐Illiteracy ☐Literacy, no formal education

☐Elementary school (1-6 years) ☐Junior high school (7-9 years)

☐Senior high school (10-12 years) ☐ College and above (more than 13 years)

9. Type of chronic disease:

☐None ☐Hypertension ☐Diabetes Mellitus ☐Renal disease

☐Heart Disease ☐Arthritis ☐Gout ☐Pulmonary Disease

☐Osteoporosis ☐Other

Appendix M2: Demographic Questionnaire (Chinese Version)

社會人口學問卷

1. 出生年月:_____年 ____月 (____歲)
2. 性別: □ 女 □ 男
3. 請問您住在東勢多久了? _____年
4. 您有參加任何社團嗎? □ 沒有 □ 有（請描述社團名稱_____）
5. 您的教育程度:

   □不識字 □識字但未接受正式教育 □小學（1-6 年）

   □初中（7-9 年） □高中（10-12 年） □大專以上（13 年以上）
6. 您接受學校教育的年數:_____年
7. 婚姻狀況:

   □未婚（若您選此答案，請直接回答第九題）

   □已婚，與配偶同住

   □已婚，配偶已過世

   □離婚或分居，不與配偶同住

   □工作或家庭需要不與配偶同住 □其他（請描述 _____）
8. 配偶教育程度:

   □不識字 □識字但未接受正式教育 □小學（1-6 年）

   □初中（7-9 年） □高中（10-12 年） □大專以上（13 年以上）
9. 經醫師診斷的慢性疾病的種類:（可複選）

   □沒有 □高血壓 □糖尿病 □腎臟疾病

   □心臟病 □關節炎 □痛風 □肺部疾病

   □骨質疏鬆症 □其他 _____（請描述）

Appendix N1: Notification (English Version)

My name is HSIEH, Ching-Hsing（謝金杏）. I am a doctoral student at the University of Hawaii at Manoa, School of Nursing. The purpose of this study is to survey osteoporosis preventive behavior including exercise and calcium intake, and factors influencing osteoporosis preventive behavior among Hakka people. This study provides an opportunity for you to assess your behavior of osteoporosis prevention, status of social support and social capital, knowledge of osteoporosis, and confidence in osteoporosis preventive behavior.

You are selected because you consider yourself a Hakka and live in Dongshih, Taichung. If you agree to participate, you will be one of two hundred fifty subjects chosen to participate in this study. Your participation will help us to know osteoporosis preventive behavior among Hakka people. Then, we can provide adequate health services related to osteoporosis to you in the future.

This interview will take about 40 to 50 minutes and I will ask you some questions about your exercise habit and calcium intake, knowledge of osteoporosis, osteoporosis self-efficacy, status of social support and social capital. You may feel free to answer or not to answer the questions. If you feel uncomfortable during the interview, you can discontinue the interview at any time with no penalty, or loss of benefit to which you would otherwise be entitled.

Confidentiality of participants will be maintained via code number and protected files. Any information connected with participants will be remained confidential. No personal identifying information will be included with the research results. All the data

utilized in this study will be destroyed at the completion of the study. A 100 N.T.D certificate of 7-11 convenient stores will be provided in appreciation of your help, time, and cooperation.

If you have any questions regarding this research project, please call me at (04) 25872548. The supervisory professor is WANG, Chen-Yen, Ph.D. CDE. ANP. (TEL: 002-1-808-550-5686). If you have any questions regarding your rights as a research participant, please contact the University of Hawaii Committee on Human Studies at 002-1- 808-539-3955.

You should keep this notification for your own future reference.

Thank you for your assistance and cooperation.

Appendix N2: Notification (Chinese Version)

通知書

您好！我的名字是謝金杏，目前是美國夏威夷大學護理博士班的學生。這份問卷調查的主要目的是想調查客家人的骨質疏鬆症預防行爲（包括運動與鈣質攝取飲食習慣）以及影響骨質疏鬆症預防行爲的因素。這個研究讓您有機會評估自己的骨質疏鬆症預防行爲、骨質疏鬆症的知識、骨質疏鬆症自我效能與您擁有的社會支持與社會資本狀態。

因爲您是住在台中縣東勢鎮且認爲自己是客家人，所以您被邀請參與這次的研究。這個研究預計將會訪問 250 位的東勢客家人。若您同意參與這次的研究，您將會是 250 位客家人之一。因爲您的參與，將有助於我們了解客家人的骨質疏鬆症預防行爲，也才能在日後爲您提供適切的骨質疏鬆症健康服務。

這次的問卷調查大約會花 40 到 50 分鐘，您會被問到的問題包括您的運動習慣、鈣質攝取的飲食習慣、骨質疏鬆症的知識、骨質疏鬆症自我效能、社會支持與社會資本狀態之相關問題。您可以自由的選擇回答或是不回答這些問題。問卷調查的過程當中，如果您覺得有任何不舒服的情況發生，您可以隨時停止參與這個研究。

這是一個不記名的研究。爲確保您的資料的隱密性，您的身分將會被一個號碼所取代。從這個研究中獲得的任何資料將會被安全的保存，唯有在您的同意下，這些資料才會被公佈。任何可以辨識您身分的資料不會出現在我們的研究結果，並且在這個研究完成之後，所有的資料將會隨之銷毀。爲感謝您的幫助、時間與合作，我們會送您一張 7-11 的 100 元禮卷。

如果您有任何問題，歡迎您與我聯繫（電話：04-25872548）。我的指導教授是王倩燕博士（電話: 002-1-808-550-5686）。如果您有任何關於參與這個研究的自身權利問題，歡迎您與夏威夷大學人類研究委員會聯繫（電話：002-1-808-539-3855）。爲了您日後的需要，您應該保留份此通知書。

最後再次感謝您的支持與合作。

Appendix O: Table of Calcium Contained in Food

Name of food	A unit	1/3 unit (mg)	½unit (mg)	1unit (mg)	11/2unit (mg)	Two units and more (mg)
Milk	240 cc/1 box or 1 glass	87	130	260	390	520
Yogurt	200 cc/1 small bottle or 1 glass	39	59	117	176	234
Cheese	20gm/1 piece	39	59	117	176	234
Tofu	125gm/1 pack	58	88	175	263	350
Dry tofu	60gm/2 pieces	55	82	164	246	328
Small dry fish	10gm/1 spoon	74	111	221	332	442
Kelp	85 gm/1/2 bowl	29	44	87	131	174
Beans	90 gm/1/2 bowl (peanuts: 75 gm/1/2 bowl)	21	32	63	95	126
Dark colored vegetables	75 gm/1/2 bowl	35	52	104	156	208

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