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Frequent shopping by men and women increases survival in the older Taiwanese population

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ABSTRACT

Background Active ageing is a key to healthy ageing; shopping behaviour is an economically relevant activity of the elderly.

Methods Analysis was based on the NAHSIT 1999–2000 dataset. A total of 1841 representative free-living elderly Taiwanese people were selected and information included demographics, socioeconomic status, health behaviours, shopping frequencies, physical function and cognitive function. These data were linked to official death records. Cox proportional hazard models were used to evaluate shopping frequency on death from 1999–2008 with possible covariate adjustment.

Results Highly frequent shopping compared to never or rarely predicted survival (HR 0.54, 95% CI 0.43 to 0.67) with adjustment for physical function and cognitive function and other covariates HR was 0.73 (95% CI 0.56 to 0.93). Elderly who shopped every day have 27% less risk of death than the least frequent shoppers. Men benefited more from everyday shopping than women with decreased HR 28% versus 23% compared to the least.

Conclusion Shopping behaviour favourably predicts survival. Highly frequent shopping may favour men more than women. Shopping captures several dimensions of personal well-being, health and security as well as contributing to the community's cohesiveness and economy and may represent or actually confer increased longevity.

INTRODUCTION

'Active ageing', postulated by WHO in 2002, is defined as 'the process of optimizing the opportunities of health, participation and security to enhance quality of life when people age'. In this definition, 'active' refers to 'continuing participation in social, economic, culture, spiritual and civic affairs, not just the ability to be physically active or to participate in labor force'.[1] This highlights the importance of engagement in a variety of activities by ageing people.

The conventional view of health promotion pays attention to physical activities, which generate evident health benefits,[2–4] and recommended levels of physical activity have been made for older people.[5] Engagement in social and economic activities in later life also contributes to better health outcomes, including survival.[6–10] Social and economic activities may be as important as physical activities in healthy ageing.

The extent to which the elderly can participate in social and economic activities may be subject to their declining functional abilities, including impaired physical and mental functions, which may adversely affect survival. A higher level of engagement in these activities may improve functional health.[11 12] This raises the question as to whether more engagement in these activities, associated with reduced later mortality, merely reflects better baseline functional health or, alternatively, whether it contributes to survival independently of the contemporary functional status. The relationships of social activities to survival are confounded by functional health[6 8 10] but, for some activities, there remains a significant effect on survival when functional health is taken into account.[6 7 9 10] There is a question as to which activities benefit health and in which way these might vary in different settings. There is a need to examine associations between specific activities and their health outcomes.[7]

Among these activities, shopping is one with major economic relevance even when most of the aged have left the labour market. Shopping is consumptive insofar as it is intended to make purchases. It is also productive since providing shopping services has a market value. The elderly may spend varying times and monetary resources shopping according to personal and environmental circumstances. Shopping is generally not a problem for younger elderly but creates difficulties for the very old[13] since those with severe functional limitations are less likely to shop; male elders spend more time shopping than do their female counterparts.[14] Retirees and the unemployed might spend more time shopping or shop more frequently to avoid purchasing food at high prices.[15] Favourable characteristics of neighbourhood built environments could promote walking activity, which is an essential component in shopping among elders.[16]

Shopping activity represents an important part of social and economic life for the aged. Yet its relationship to survival appears not to have been specifically evaluated. We have tested whether shopping activity, measured as frequency, can contribute to prolongation of later life independent of physical and cognitive functions.[17] It is considered that women and men have different purposes or patterns in shopping,[18] which might impact on health in different ways. In the present study we investigate gender difference in the relationship between shopping activity and long-term survival.

METHODS

Study population

The present study used data from the Elderly Nutrition and Health Survey in Taiwan (NAHSIT Elderly), a nationally representative sample of the free-living elderly (65 years and over), conducted in 1999 and 2000. Details of design and sampling for this survey can be found elsewhere.[19] The NAHSIT

dataset was linked to 1999–2008 National Death Registration data to determine their survival status. All deaths that occurred between study entry and 31 December 2008 were included. A total of 1937 elderly persons completed the household interview and 1891 had a verifiable national identity number that would allow linkage to the National Death Registry. Altogether, 39 participants had no shopping data, 8 had an unlikely response about their means of transport and 3 had incorrect date of death. This left 1841 eligible participants for analysis. All participants signed informed consent. The ethics committees of National Health Research Institutes and of Academia Sinica in Taiwan approved the study protocol.

Measurements

Shopping frequency was measured by the following question: 'What is the frequency with which you go out shopping?' The response options were 'never or less than once a week', 'once a week', '2 to 4 times a week' and 'everyday'.

Cognitive function was measured by the Short Portable Mental Status Questionnaire for assessing mental functioning of the elderly.[20] This test included 10 questions dealing with orientation, personal history, remote memory and calculations. A summary score rang 0–10 can be categorised into normal mental functioning and mild, moderate and severe cognitive impairment. It was validated in a Taiwanese population.[21]

Physical function (PF) was measured by the physical functioning subscale of the SF-36 Health Survey in a validated traditional Chinese version.[22] The scale consists of 10 items evaluating inability in basic physical activities, including moderate activities, vigorous activities, lifting or carrying, climbing flights, bending, kneeling and stooping, walking, and bathing or dressing. The scale outcomes were transformed into norm-based scores in which a higher score indicates better physical function.[23] We categorised the scores into four groups as <45, 45–53.9, 54–57.9 and ≥58 in regard to distribution. The categorical levels indicated various extents to which physical function was limited by a responder's health. In this sample, for example, all of PF≥58 were without any limitation in the 10 activities whereas 80% of PF<45 reported limitations in at least 7 activities.

Demographic, socioeconomic status and health behaviour variables used in the present study included age, gender, education, ethnicity, perceived financial status, working status, smoking, alcohol drinking and exercise. The number of comorbidities was scored according to the sum of 12 chronic diseases explored at interview to reflect general health status. A question about dinner companions was used as an indicator of social connectedness.[24] Means of transport and residential locality were also taken into account.

Survival time was the interval between the date of interview and the date of death or 31 December 2008 when censored for survivors.

Statistical analysis

All data were weighted to represent the elderly population in Taiwan during 1999–2000. The χ^2 tests were used for categorical variables across shopping frequency groups. In multivariable analyses, the Cox proportional hazard models were used to assess the association between predictors and survival time. In the models we treated those who never shopped or shopped less than once a week as the reference group. The models, adjusting for physical function, cognitive function or both, revealed the influences of functional health on the relationship of shopping frequency to survival. Work status, perceived financial status and transport means were used to adjust for leisure time, purchasing power and travel costs for shopping, respectively. A spurious correlation between shopping frequency and late mortality may occur for those who were very ill and unable to shop. Hence, an additional model was created for a sub-sample, which excluded participants who had great difficulty in shopping. Finally, the gender-shopping frequency interaction terms were estimated to explore gender difference in the shopping–survival relationship. Since these models included relevant variables with different numbers of missing values, they had different case numbers. All analyses were performed using SAS statistical software version 9.1.3 and SUDAAN version 10.0 was used to adjust for the design effect of sampling.

RESULTS

Tables 1 and 2 present demographics, baseline functional status and other study variables, and their distributions across four shopping frequencies. After weighting for representativeness of the participants, nearly half (48%) of the elderly were those who never shopped or shopped less once a week, followed by frequent shoppers who shopped two to four times a week (22%) and every day (17%); the lowest was 13% who shopped once a week. The majority of the study population were those aged less than 75 years (62%), men (54%), financially sufficient (76%), not working (90%), non-alcohol drinkers (74%), non-smokers (62%) and involved in frequent exercise (55%). The most popular transport means for outings was the private vehicle (47%) (table 1). About one-quarter had the worst physical function status (PF<45) and less than a tenth had moderate and severe cognitive impairment. Deceased participants amounted to 37% during the study period and more than 60% of participants reported up to two chronic diseases (table 2).

Higher shopping frequencies (more than once a week) were associated with younger elders, male gender, high school and elementary school education, currently working and retired, dining with friends or neighbours, smoking, frequent exercise, better physical function and cognitive function, and travelling by walking ($p<0.05$) (tables 1 and 2). These variables, except dinner companions, were also associated with later mortality (see online supplementary table 1). They were potential confounders in multivariable analysis. Notably, there were more who had been inactive shoppers among the deceased (59%) and more frequent shoppers among survivors (43%), which indicates an inverse association between shopping frequency and later mortality (table 2).

Table 3 shows the Cox models, which predict survival time of the participants. Without any adjustment, the crude model shows that shopping once a week (HR 0.48, 95% CI 0.34 to 0.68), two to four times (HR 0.62, 95% CI 0.49 to 0.80) and shopping every day (HR 0.54, 95% CI 0.43 to 0.67) were associated with a lower mortality risk significantly compared to no shopping activity ($p<0.001$ for all HRs). Likewise, model 1, which adjusts for a set of essential covariates, revealed that people who shopped more than once every week were at a lower risk of mortality than those who did not. The lowest risk of mortality is 'every day' (HR 0.58, 95% CI 0.44 to 0.77). When financial status, work status and transport means were included, 'every day' remains with a low HR of 0.61 (95% CI 0.45 to 0.82; $p<0.01$), but HRs for 'once' (HR 0.73, 95% CI 0.49 to 1.08) and 'two to four times' (HR 0.80, 95% CI 0.64 to 1.01) become higher and insignificant.

Controlling for physical function leads to an increment in RR for every day shopping from 0.61 in model 2 to 0.70 in model 3

Table 1 Demography, study variables and their distributions by shopping frequencies in Elderly Nutrition and Health Survey in Taiwan 1999–2000 participants* (n=1841)

		Weekly shopping frequency (%)				
Descriptor	**n†**	**Less than once**	**Once**	**2–4 times**	**Every day**	**p Value‡**
Total	1841	48.0	13.0	22.3	16.7	
Gender						<0.001
Male	933	42.5	12.5	24.3	20.7	
Female	908	54.4	13.6	20.1	12.0	
Age at baseline						<0.001
65–69 y	606	38.9	16.8	24.8	19.5	
70–74 y	637	44.0	13.3	26.3	16.5	
75–97 y	598	58.4	9.8	17.1	14.7	
Education						0.004
Illiterate	635	59.3	11.4	17.2	12.1	
Elementary school and below	820	40.8	13.3	24.6	21.2	
High school	317	38.4	15.4	29.3	16.9	
College and above	62	59.6	11.5	15.4	13.6	
Ethnicity						0.7
Non-indigenous	1652	48.1	12.8	22.4	16.7	
Indigenous	187	43.8	20.4	21.8	14.1	
Perceived financial status						0.1
Enough or just enough	1242	46.3	14.0	22.9	16.9	
Some difficulty	439	48.8	10.9	24.2	16.0	
Very difficult	100	58.0	7.4	12.9	21.7	
Smoker						<0.001
Never	1192	51.3	14.0	21.3	13.4	
Former	235	43.1	11.5	21.4	24.0	
Current	405	42.3	11.5	25.4	20.9	
Alcohol drinker						0.2
No	1344	50.8	12.8	21.1	15.3	
Former	124	43.3	13.6	27.1	16.0	
Current	369	39.1	14.0	25.1	21.8	
Exercise frequently						0.003
No	900	56.6	11.2	17.2	15.0	
Yes	939	41.0	14.5	26.5	18.0	
Dinner companions						<0.001
Self	322	48.6	10.8	20.9	19.7	
Spouse	694	39.4	14.4	27.4	18.8	
Children and relatives	811	55.2	12.7	18.4	13.7	
Friends or neighbours	10	6.5	17.7	57.7	18.1	
Transportation						<0.001
Never going out	141	100.0	0.0	0.0	0.0	
Private vehicle (motorcycle or car)	888	45.8	15.1	23.9	15.2	
Public	418	45.2	17.9	22.4	14.6	
Bicycle	161	37.3	12.5	28.5	21.7	
Walking	232	33.5	8.1	26.3	32.1	
Current work status						0.01
Yes	173	31.7	21.5	29.8	17.1	
Retired	1032	46.3	11.5	23.1	19.1	
Housewife	531	56.0	13.0	19.8	11.3	
Never employed	91	63.5	16.1	9.4	11.1	
Duration of observation (median, y)		8.5	8.8	8.8	8.8	

*% are weighted to reflect their representation in the population.
†Total sample size is 1841; cases with missing values were not included for the relevant variable.
‡χ^2 test by SUDAAN programme.

(95% CI 0.54 to 0.90), whereas controlling for cognitive function results in a smaller increment to 0.65 (95% CI 0.49 to 0.86). With adjustment for both functional variables in model 5, 'every day' predicts a HR of 0.73 (95% CI 0.56 to 0.93) as the risk of death. Finally, in model 6, which only includes the participants capable of shopping activity without considerable difficulty, daily shopping remains protective against mortality for even these, the healthier elders (HR 0.76, 95% CI 0.59 to 0.97).

A gender-shopping frequency joint effect on survival was evident in a model with these interaction terms based on model 5 ($p<0.05$). An equivalent model, where eight gender-shopping frequency combined categories were created as predictors, indicated different trends of HRs for men and women as shown in figure 1. For men, there was apparently a relative fall in HR to 0.72 with everyday shopping (28% less than inactive shoppers). By contrast, HRs continuously decreased with increased shopping frequencies for women from 0.69 to 0.53 (23% less than inactive shoppers). Despite the gender differences at each shopping frequency, the HR trends seem downward for both men and women.

Table 2 Baseline functional status, comorbidity, survivorship and their distributions by shopping frequencies in Elderly Nutrition and Health Survey in Taiwan 1999–2000 participants* (n=1841)

		Weekly shopping frequency (%)				
Descriptor	**n†**	**Less than once**	**Once**	**2–4 times**	**Every day**	**p Value‡**
Physical functioning						<0.001
<45	470	70.8	5.7	13.8	9.7	
45–53.9	572	45.3	13.1	23.5	18.2	
54–57.9	496	38.2	16.6	26.6	18.7	
≥58	271	29.0	19.4	28.5	23.1	
SPMSQ						<0.001
Normal	1467	41.8	14.4	24.7	19.0	
Mild	167	65.2	10.7	14.8	9.4	
Moderate	153	79.6	3.8	12.3	4.3	
Severe	26	90.6	1.3	2.1	6.0	
Number of comorbidities						0.5
0	335	45.9	16.1	17.5	20.5	
1–2	840	47.4	13.0	23.9	15.8	
3–5	559	49.9	11.8	22.2	16.2	
≥6	107	48.7	10.3	26.6	14.4	
Survivorship						<0.001
Deceased	683	58.5	9.0	20.0	13.0	
Survivors	1158	41.8	15.4	24.0	18.9	
Mortality ID per 1000 person-year		63.8	38.4	40.2	35.6	

*% are weighted to reflect their representation in the population.
†Total sample size is 1841; cases with missing values were not included for the relevant variable.
‡χ^2 test by SUDAAN programme.
ID, incidence density; SPMSQ, Short Portable Mental Status Questionnaire.

DISCUSSION

We explored whether shopping activity could predict long-term survival in an elderly population and whether the effect would remain when functional limitations were considered. Modelling with different sets of covariates and with subset data demonstrated the robustness of the finding that highly frequent shopping activity predicts survival among elderly Taiwanese. The desirable effect of shopping activity is likely to benefit from physical and/or cognitive functions, which were evaluated in the present study.

In the present study, moderately frequent shoppers (one to four times a week) had a lower risk in mortality than inactive shoppers probably due to better health. Therefore, when physical and cognitive functions were considered, the reduction in mortality associated with shopping activity was diminished. These findings are consistent with those of previous studies.[6–8 10] Moderate shopping participation may be mainly to do with the purchase of necessities; its restriction could represent compromised function. Moreover, an elder who shops less for food would be at risk of poorer diet quality necessary to maintain health.[25–27] A vicious cycle that involves limited shopping and poor diet could evolve for elders.

Every day shoppers had a favourable survival even with control for functional health, which implies that greater participation in activities generates more health benefits.[28] It is possible that daily shopping might have a direct impact on survival or enhance socio and psycho-biological pathways, which mediate between shopping activity and survivorship and not only reflect better functional health. Health benefits might be generated through frequent shopping activity in many ways.

Making purchases may not be the main purpose in shopping for elders.[29] This might be reflected in the fact that shopping frequency was not constrained by purchasing power, which was measured by perceived financial status (table 1). Elderly people may window shop, obtain prescribed drugs, bank, or walk for exercise, seek companionship and avoid loneliness. Fulfillment of these purposes may generate various health benefits. For example, elders may maintain a mall walking routine, perhaps regarded as shopping activity, although more to do with the need to belong to a community or keep physically active in a safe and convenient environment.[30] In shopping venues, socialising with or watching others can provide social and mental benefits.[31] Loneliness may be ameliorated through relationships away from home in commercial venues that nevertheless provide opportunities for companionship and emotional support.[32] However, the present study does not assess these roles for shopping and, therefore, cannot assign relative importance to them.

We found gender difference in the relationship between shopping and survival. The population attributable risk for mortality attributed to shopping inactivity as opposed to everyday shopping was 21% for men and 48% for women (data not shown). In multiple regression analysis, the mortality risk of men was reduced by up to 28% with every day shopping while it was 23% for women. The non-linear trend for the mortality HR

Table 3 The relationships between shopping frequency and risk of death

		Weekly shopping frequency			
		HR (95% CI)			
	n	**Never or less‡ than once**	**Once**	**2–4 times**	**Every day**
Crude§	1841	1	0.48 (0.34 to 0.68)***	0.62 (0.49 to 0.80)***	0.54 (0.43 to 0.67)***
Model 1¶	1816	1	0.60 (0.42 to 0.86)**	0.73 (0.58 to 0.91)**	0.58 (0.44 to 0.77)***
Model 2**	1744	1	0.73 (0.49 to 1.08)†	0.80 (0.64 to 1.01)†	0.61 (0.45 to 0.82)**
Model 3††	1717	1	0.79 (0.54 to 1.15)	0.91 (0.74 to 1.12)	0.70 (0.54 to 0.90)**
Model 4‡‡	1721	1	0.76 (0.53 to 1.09)	0.84 (0.66 to 1.08)	0.65 (0.49 to 0.86)**
Model 5§§	1713	1	0.83 (0.58 to 1.19)	0.94 (0.75 to 1.18)	0.73 (0.56 to 0.93)*
Model 6¶¶	1574	1	0.89 (0.61 to 1.28)	0.98 (0.77 to 1.24)	0.76 (0.59 to 0.97)*

HRs were estimated by the Cox proportional-hazards model.
Significance is shown by †p<0.1, *p<0.05; **p<0.01; ***p<0.001.
‡Never or less than once as reference group.
§Likelihood ratio χ^2=59.3 at 3 *df*; p<0.01.
¶Adjusted for gender, age, education, ethnicity, alcohol drinking, smoking, exercise, dinner companions, comorbidity and region. Likelihood ratio χ^2=292.9 at 33 *df*; p<0.01.
**Adjusted by model 1 covariates plus perceived financial status, work status and transportation. Likelihood ratio χ^2=346.4 at 42 *df*; p<0.01.
††Adjusted by model 2 covariates plus physical functioning. Likelihood ratio χ^2=384.4 at 45 *df*; p<0.01.
‡‡Adjusted by model 2 covariates plus Short Portable Mental Status Questionnaire (SPMSQ). Likelihood ratio χ^2=388.6 at 45 *df*; p<0.01.
§§Adjusted by model 2 covariates plus physical functioning and SPMSQ. Likelihood ratio χ^2=412.6 at 48 *df*; p<0.01.
¶¶Model 5 for a sub-sample, which excluded those who were unable to shop due to difficulty. Likelihood ratio χ^2=273.6 at 48 *df*; p<0.01.

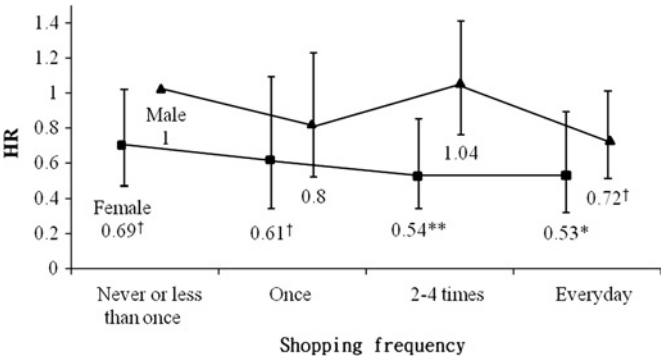

Figure 1 HRs for eight gender-shopping categories from the model adjusted by age, education, ethnicity, alcohol drinker, smoker, frequent exercise, region, dinner companions, perceived financial status, comorbidity, work status, transportation, physical function and Short Portable Mental Status Questionnaire. Significance is shown by †$p<0.1$, *$p<0.05$; **$p<0.01$. Interaction of shopping frequency and gender $p=0.02$.

for men to decrease with increased shopping frequency (the upwards relationship contour for men who shopped two to four times a week) may reflect complex shopping-related behaviours. For example, men, who smoke or drink alcohol more than women, might shop for these alone or look for an excuse to consume them away from home; in these situations there will be competing risks between putatively favourable shopping activity and the adverse consequences of what it may entail. This viewpoint was supported by the findings of our study that current smokers and alcohol drinkers were a higher percentage in the higher shopping frequency groups (two to four times and every day) than those who were never smokers or habitual drinkers of alcohol (table 1), and that more men than women consumed cigarettes (men 39% vs women 3%) and alcohol (men 31% vs women 5%).

Missing values in multivariable analysis might have challenged the representativeness of our final sample. From the crude model to model 5 (the full model), participants in the analysis fell to 1713 from 1841 due to incomplete questionnaire responses. Compared to the total sample (1937 participants), although those excluded tended to be older elderly, women, have lower education and worse functional status, there was negligible difference in the demographics or in variables of interest between those included in the full model and the total sample (see online supplementary table 2). The sub-sample used in the multivariable models was representative of the total study population and secured the internal validity required.

Study limitations to be canvassed include the interpretation of shopping as a method of social engagement. It correlates with other social activities, which have been inadequately documented in our study. However, we have used dining together as a surrogate for non-shopping social activity or networks and adjusted for it. Even so, shopping, as a predictor of survival, would capture various social engagement variables. Further investigation of the shopping-independent and combined effects with a range of societal factors on mortality is warranted.

Another interpretative limitation is that shopping might also improve functional health, but the reverse may also be possible or the link bi-directional. Because these variables, and others at baseline, were cross-sectional we are unable to explore the question of causality further.

A greater understanding of the psycho-social aspects of shopping would help clarify our findings. Shopping is often for pleasure with the potential to increase psychological well-being. Compared to other types of leisure-time physical activity, like formal exercise, which usually requires motivation and sometimes professional instruction, shopping activity is easier to undertake and maintain. Its informality makes it a more attractive alternative than more prescriptive approaches to healthy ageing.

What is already known on this subject

- Physical activities along with engagement in social and economic activities have been recognised as vital for healthy ageing, but few studies have investigated whether there is a link between shopping behaviour and long-term survival among the elderly.

What this study adds

- Everyday shopping increased survival in the elderly.
- When taking account of cognitive and physical function, the favourable effect remained.
- Elderly men benefited more from every day shopping activity than did elderly women.

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Competing interests None.

Ethics approval This study was conducted with the approval of the National Health Research Institutes Ethics Committee.

Contributors YHC planned the study, supervised the data analysis and wrote the paper. RCYC performed all statistical analyses and helped to revise the paper. MW and MSL contributed to and revised the manuscript.

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