The Relation Between Everyday Activities and Successful Aging: A 6-Year Longitudinal Study

Verena H. Menec

Department of Community Health Sciences, University of Manitoba, Winnipeg, Manitoba, Canada.

Objectives. Activity has long been thought to be related to successul aging. This study was designed to examine longitudinally the relation between everyday activities and indicators of successful aging, namely well-being, function, and mortality.

Methods. The study was based on the Aging in Manitoba Study, with activity being measured in 1990 and function, well-being, and mortality assessed in 1996. Well-being was measured in terms of life satisfaction and happiness; function was defined in terms of a composite measure combining physical and cognitive function.

Results. Regression analyses indicated that greater overall activity level was related to greater happiness, better function, and reduced mortality. Different activities were related to different outcome measures; but generally, social and productive activities were positively related to happiness, function, and mortality, whereas more solitary activities (e.g., handwork hobbies) were related only to happiness.

Discussion. These findings highlight the importance of activity in successful aging. The results also suggest that different types of activities may have different benefits. Whereas social and productive activities may afford physical benefits, as reflected in better function and greater longevity, more solitary activities, such as reading, may have more psychological benefits by providing a sense of engagement with life.

THE notion that activity is related to well-being has a long history (Burgess, 1954; Havighurst & Albrecht, 1953). Initially presented more as a fact than a theory, activity theory was more formally developed by Lemon, Bengtson, and Peterson (1972), with these authors explicitly specifying the nature of and mechanisms underlying the relation between activity and life satisfaction. Since these early conceptualizations, the relation between activity and well-being has been studied extensively. A recent version of activity theory is presented in Rowe and Kahn's (1997) definition of "successful aging." Similar to earlier conceptualizations (Havighurst, 1961), Rowe and Kahn considered active engagement, in combination with absence of disease and good physical and cognitive function, an integral part of successful aging. Active engagement, according to these authors, is defined as productive activity—paid or in the case of older adults more likely unpaid activities that create societal value, such as volunteer work—and maintenance of interpersonal relations.

Although Rowe and Kahn's (1997) definition focuses on successful aging as an outcome—that is, what are the characteristics of somebody who has aged successfully—being active is likely part of an ongoing process that ultimately has benefits in a wide range of domains in later life, including health and function. The purpose of the present article was to address this issue by examining the contribution of everyday activities, such as participating in social activities, reading, and volunteering, to a variety of factors, namely well-being, function, and survival. The term *successful aging* is used here as a summary label to refer to these "outcomes," although it is recognized that other definitions of successful aging have been used in the literature (e.g., Baltes & Baltes, 1990; Havighurst, 1961).

Activity and Successful Aging

Activity theory emphasizes the link between activity and well-being, specifically life satisfaction (Lemon et al., 1972). The theory suggests that both the frequency of participation in activities and their level of intimacy are important for life satisfaction. The greater the frequency of activity, the greater the life satisfaction. Similarly, the more intimate the activity, the greater the life satisfaction, which leads to the more specific hypothesis that informal social activities should be more highly related to life satisfaction than formal activity which, in turn, should be more highly related to life satisfaction than solitary activity.

Research generally supports the first of these postulates. Activity level, measured either in terms of the number of activities individuals engage in or the frequency with which they engage in a range of activities, has been shown to be positively related to well-being in a number of studies (e.g., Beck & Page, 1988; Herzog, Franks, Markus, & Holmberg, 1998; Lawton, Winter, Kleban, & Ruckdeschel, 1999; Markides & Martin, 1979; Menec & Chipperfield, 1997b). Besides its relation to well-being, studies also show that activity level predicts functional and cognitive status (Garfein & Herzog, 1995), incidence of Alzheimer's disease (Scarmeas, Levy, Tang, Manly, & Stern, 2001; Wilson et al., 2002), and physical health (Everard, Lach, Fisher, & Baum, 2000). Activity level has also been shown to be related to survival (Glass, de Leon, Marattoli, & Berkman, 1999; Lennartsson & Silverstein, 2001; Stones, Dornan, & Kozma, 1989; although see Lee & Markides, 1990, for nonsignificant findings).

The second postulate of activity theory regarding the importance of intimacy, however, has received less empirical

support. Although research generally corroborates the view that social activity is positively related to well-being (e.g., Garfein & Herzog, 1995; Litwin, 2000; Morgan et al., 1991; Okun, Stock, Haring, & Witter, 1984; Zimmer, Hickey, & Searle, 1995), there is little evidence that informal activity affords benefits over formal activity (see Okun et al., 1984, for a meta-analysis).

According to activity theory (Lemon et al., 1972), solitary activities should also be linked to life satisfaction, although to a lesser extent than social activities. Whether this is indeed the case has not been determined conclusively. Solitary activity was not associated with well-being in some studies (Longino & Kart, 1982; Litwin, 2000; Zimmer et al., 1995), although a positive relation was found in another (Beck & Page, 1988). Solitary activity has also been shown to be positively related to mental health (Everard et al., 2000) and "successful aging" among women (defined in terms of survival to age 75, physical function, and happiness; Palmore, 1979). Similarly, in a recent study, "solitary-active" activity was associated with a reduced mortality risk for men, but not women (Lennartsson & Silverstein, 2001).

A problem that has plagued the literature on activity is the lack of consistency in activity measures. For example, whereas some studies define solitary activities in terms of reading or watching television (Longino & Kart, 1982; Litwin, 2000; Zimmer et al., 1995), others inlude participation in hobbies and gardening in their definition (Lennartsson & Silverstein, 2001). Yet other researchers have classified activities like gardening or housework as productive activities (Glass, Seeman, Herzog, Kahn, & Berkman, 1995; Glass et al., 1999). Productive activity has indeed been shown to be related to 13-year survival (Glass et al., 1999). Productive activity has also been found to be positively related to life satisfaction among men (Keith, 1980; Morgan et al., 1991).

Thus, given the inconsistencies in defining activities, it is difficult to compare results across studies. However, it seems safe to conclude that social and productive activities are positively related to well-being, with the verdict on the benefits of solitary activity still being out. Similarly, there is some, albeit more limited, evidence for a relation between social and productive activities and survival.

Conclusions regarding other effects have to remain tentative given the relative paucity of research linking activity to other outcome measures, such as function. Given that the literature has focused mainly on the relation between activity and well-being, it is also not clear whether different types of activities have different benefits. However, it seems plausible to assume that this would be the case. For example, although reading a daily newspaper may allow an individual to keep in touch with local and world events, thereby contributing to feelings of being engaged in life and consequently life satisfaction, it may have no benefits in terms of function. Productive activities, such as gardening or housework, in contrast, may be psychologically as well as physically beneficial, as reflected for instance by a slowing of functional decline and greater longevity (cf. Glass et al., 1999). Given such potentially different effects, it would therefore seem important to examine the relation between specific activities and a range of outcomes.

Implicit in this discussion is that activity promotes health and well-being rather than vice versa. Most of the extant studies that have focused on the relation between activity and well-being, however, have been cross-sectional in nature. It is therefore not possible to know whether, for instance, participation in social activities promotes greater well-being or whether greater life satisfaction provides an impetus for being more socially active. Indeed, although most cross-sectional studies show a positive association between activity and life satisfaction, a rare longitudinal study shows no significant relation (Markides & Lee, 1990). The relations between activity and functional health and self-rated health were also not significant in Markides and Lee's (1990) longitudinal study. Although longitudinal studies cannot determine causality, they can at least provide some information on the temporal relation among these variables.

The Present Study

Thus, the purpose of the present study was to examine the relation between activity and several indicators of successful aging, namely well-being, function, and mortality. Two research questions were addressed: (a) What is the relation between overall activity level and subsequent well-being, function, and mortality? and (b) what is the relation between specific activities (e.g., visiting family or friends, attending activities for older adults, reading) and subsequent well-being, function, and mortality?

The role of activity was therefore examined in two different ways. First, activity was defined in terms of the number of activities individuals engaged in during the previous week, the assumption being that "more is better" (Lemon et al., 1972). This measure is, therefore, simply a count of activities, with greater activity level presumably being beneficial, regardless of the kinds of activities in which people engage. Second, each activity was examined separately to determine which specific activities relate to each outcome measure.

Activity was measured in 1990, and well-being, function, and mortality 6 years later, in 1996. Well-being was defined in terms of two separate indicators — life satisfaction and happiness. Following previous research (Garfein & Herzog, 1995; Roos & Havens, 1991), function was defined as a composite measure based on physical and cognitive function. In all analyses, factors known to predict well-being, function, and mortality were controlled, including demographic variables, baseline function and well-being, health status, and social support network.

METHODS

Data Source

The data source was the Aging in Manitoba (AIM) Study. AIM is the largest and longest running study on aging in Canada. Separate representative samples of older adults living in Manitoba (identified using an age–gender stratified area-probability sampling procedure) were interviewed in 1971, 1976, and 1983, respectively (see Chipperfield, Havens, & Doig, 1997, for details). Survivors from the 1971 and 1976 cohorts were surveyed again in 1983. In 1990, 3,218 survivors of the three cohorts were reinterviewed and, in 1996, 1,868 survivors were again surveyed.

All interviews were conducted on a one-on-one basis in participants' place of residence. Interviews lasted approximately 1 to 1.5 hours. The interview focused on a wide range

of topics, including health, function, well-being, social support networks, and so forth. For individuals who were too frail or cognitively impaired to answer questions themselves, information for select measures was obtained from proxy respondents.

Study Sample

For the present purposes, the 1990 and 1996 interviews of AIM were used. The analyses were based on individuals who had complete data on all measures. The specific number of participants that could be included in the analyses therefore differed somewhat across the different outcome measures. Specifically, the sample size was 1,439 when looking at happiness, 1,208 for life satisfaction, and 1,292 for function. Mortality analyses were based on a larger sample involving 2,291 individuals.

The majority of older adults who had to be excluded from the analyses involved proxy responses. Subjective questions, such as those related to well-being, were not asked from proxy respondents. As one might therefore expect, individuals included in the analyses differed systematically from those excluded on most variables measured in 1990 in that they were younger, better educated, more active, had more friends, were in better health, exhibited better physical and cognitive function, and reported higher life satisfaction. AIM includes both community and nursing home residents. As proxy respondents (many of whom were in nursing homes) had to be excluded from the analyses, the study sample is based predominantly on community residents, however.

Predictors (Measured in 1990)

Demographic information.—Gender, age, and education were included in all the analyses. Details are provided in Table 1.

Social support.—Two indices of social support were included in the analyses: living arrangements (lives with adults vs. alone) and number of close friends. For the latter question, participants indicated how many close friends they had. The responses were then grouped into three categories (see Table 1 for details).

Functional status.—Functional status was measured by asking participants whether they were able to engage in various basic activities of daily living (ADLs) and instrumental activities of daily living (IADLs). Questions were taken from scales routinely used in the gerontological literature (Branch, Katz, Kniepman, & Papsidero, 1984; Branch & Meyers, 1987; Katz, Ford, Moskowitz, Jackson, & Jaffee, 1963). The ADL scale included the following 10 items: going up and down the stairs, getting about the house, getting in and out of bed, washing or bathing or grooming, dressing and putting shoes on, cutting toenails, eating, taking medication or treatment, using the toilet, and using the telephone (Cronbach's α = .71). IADLs were measured with seven items: doing light housework, doing heavy housework, preparing a hot meal, shoveling and yard work, shopping, managing financial matters, and doing laundry (Cronbach's α = .73).

For each question, participants indicated whether they were capable of engaging in the activity without help (0) or whether they needed assistance (1). Summary scores were created by

Table 1. Description of Measures and Sample (N = 1,439)

Variable	Codes or Range	% or M (SD)
1990 Measures		
Gender	Male = 1	38.9%
	Female = 2	61.1%
Age	67–95 years	75.7 (6.2)
Years of education	1 = 0 years	3.9 (1.2)
	2 = 1–4 years	
	…	
	7 = 16 years and over	
Living arrangements	1 = Lives with adults	61.2%
	2 = Lives alone	38.8%
Number of friends	0 = None	12.1%
	1 = 1–3	38.3%
	2 = 4+	49.6%
ADLs	0 = Independent	89.9%
	1 = Some assistance needed	10.1%
IADLs	0 = Independent	57.7%
	1 = Some assistance needed	42.3%
Cognitive impairment	0 = No impairment (MSQ ≥ 7)	97.7%
	1 = Some impairment (MSQ < 7)	2.3%
Physical difficulties	0 = None	79.5%
	1 = Some difficulties	20.5%
Self-rated health	1 = Bad/poor	4.7%
	1 = Fair	27.4%
	1 = Good	52.1%
	0 = Excellent (reference group)	15.8%
Morbidity	0–12 health problems	3.1 (2.2)
Life satisfaction	0–20	13.9 (3.8)
Activity level	1–18 activities	8.3 (2.6)
1996 Measures		
ADLs	0 = Independent	60.2%
	1 = Some assistance needed	39.8%
IADLs	0 = Little assistance needed (0/1 IADLs)	48.0%
	1 = Some assistance needed (>1 IADLs)	52.0%
Cognitive impairment	0 = No impairment (MSQ ≥ 7)	89.4%
	1 = Some impairment (MSQ < 7)	10.6%
Physical difficulties	0 = None	65.3%
	1 = Some difficulties	34.7%
Happiness	1–5	4.6 (0.74)
Life satisfaction[a]	0–20	12.7 (3.8)
Function[a] (composite measure)	0 = Good function	39.9%
	1 = Poor function	60.1%
Mortality[b]	0 = Alive	67.8%
	1 = Dead	32.2%

Notes: ADLs = activities of daily living; IADLs = instrumental ADLs; MSQ = Mental Status Questionnaire.

[a]Analyses for life satisfaction and function were based on 1,209 and 1,292 participants, respectively. Good function was defined as: ADLs = 0 and IADLs = 0 or 1 and cognitive impairment = 0 and physical difficulties = 0 (n = 389). Everybody else was classified as having poor function (n = 903).

[b]Mortality analyses were conducted with 2,291 individuals (1,553 alive, vs. 738 dead in 1996).

adding affirmative responses to the 10 ADL and 7 IADL items, respectively. As the resulting summary scores were highly skewed, with most participants needing no assistance with any of the activities, dichotomized variables were then created for ADLs and IADLs, where 0 = completely independent and 1 = some assistance needed (see Table 1).

Cognitive impairment.—The Mental Status Questionnaire (MSQ) developed by Kahn, Goldfarb, Pollack, and Peck (1960) was used to measure cognitive impairment. Most participants correctly answered most of the 10 questions. The scale was therefore dichotomized, with individuals with scores less than 7 classified as cognitively impaired and those with scores greater than or equal to 7 as cognitively unimpaired (see Table 1). It should be noted that this measure of cognitive impairment identifies only mild forms of impairment, as older adults with substantial cognitive impairment would likely not have participated in the study, but would have had a proxy respond for them.

Physical difficulties.—Interviewers completed a checklist of observable physical difficulties including visual impairment, use of a wheelchair, use of cane/crutches/walker, and walking difficulties. A summary score of the four items was created and subsequently dichotomized into 0 = no difficulties, 1 = some difficulties.

Self-rated health.—Self-rated health was assessed with a single item typically used in the literature (e.g., Idler & Kasl, 1991; Wolinsky & Johnson, 1992), namely the following: "For your age, would you say in general your health is good, fair, or poor?" (1 = excellent, 2 = good, 3 = fair, 4 = poor, 5 = bad). *Bad* and *poor* categories were combined as very few participants indicated that their health was bad. The measure was then dummy coded with *excellent* serving as the reference category.

Morbidity.—Participants were provided with a checklist asking them whether they had any of the following 16 health problems: heart and circulation problems, high blood pressure, heart attack, stroke, arthritis or rheumatism, palsy, eye trouble not relieved by glasses, ear trouble, dental problems, chest problems (e.g., asthma), stomach trouble, kidney trouble, diabetes, foot trouble, nerve trouble, or cancer. A total morbidity index was created by adding affirmative responses.

Life satisfaction.—The 20-item Life Satisfaction Index A (LSIA) developed by Neugarten, Havighurst, and Tobin (1961) was used to measure life satisfaction (Cronbach's α = .68).

Activity.—Participants were provided with a 21-item checklist and were asked to indicate whether they participated in each of the activities listed within the past week. For the analyses, three activities were eliminated because they lacked sufficient variability (virtually the entire sample indicated that they watched TV, listened to the radio, and shopped, and virtually nobody engaged in politically-related activities). This left 18 activities that were conceptually grouped into three categories based on their likely social component or purpose:

social activities (e.g., visiting family or relatives), more solitary activities (e.g., collecting hobbies), and productive activities (e.g., volunteer work, doing light housework/gardening). See Tables 1 and 2 for descriptive statistics.

Participants engaged on average in eight activities. Almost three quarters of the sample (74%) engaged in 6 to 11 activities, 14% engaged in 1 to 5 activities, and 12% engaged in 12 to 18 activities. As Table 2 shows, over 80% of participants had either visited or phoned family or friends. A substantial proportion also participated in other social activities such as groups for older adults. Among the more solitary activities, reading was the most common one in which participants engaged. Among the productive activities, light housework or gardening were the most common ones.

Outcome Measures (Assessed in 1996)

Life satisfaction.—As in 1990, life satisfaction in 1996 was measured with the LSIA (Neugarten et al., 1961; Cronbach's α = .70).

Happiness.—A single-item measure was used to assess feelings of happiness: "Would you describe yourself as being usually …" 1 = happy and interested in life? 2 = somewhat happy? 3 = somewhat unhappy? 4 = unhappy with little interest in life? and 5 = so unhappy that life is not worthwhile. The scale was subsequently recoded so that higher numbers indicate greater happiness and interest in life.

Function.—A composite measure of function was created based on ADLs, IADLs, MSQ (cognitive impairment), and interviewer observed physical difficulties, all measured as described above. Participants were classified as functioning well if they required no assistance with any ADLs, required assistance with a maximum of one IADL, had an MSQ score greater than or equal to 7, and had no physical difficulties, as assessed by the interviewers. This definition was derived both conceptually as a means to differentiate between individuals with good versus less good physical and cognitive function and empirically based on an examination of frequency distributions. Essentially, the cutoffs represent median splits and individuals who were above the median on all four variables were classified as functioning well. It should be noted that the labels *good* function versus *poor* function are used here in a relative sense. Individuals classified as functioning poorly might still have been very independent.

Mortality.—Whether AIM participants were dead or alive in 1996 was determined from data from the Office of Vital Statistics where all deaths in the population are recorded. In some instances, a death was revealed when attempts were made to recontact participants for the 1996 wave of AIM.

Analytic Approach

Two main sets of analyses were conducted. First, the relation between overall activity level and the four outcome measures (life satisfaction, happiness, function, and mortality) was examined with separate regressions, controlling for demographic variables, social support variables, function, and health-

Table 2. Description of Activities

"Have you participated in this activity within the past week?"	
Activity	%
Social	
Visited family or relatives	82.6
Visited friends or neighbors	84.3
Telephone conversation with friends/relatives	93.1
Church-related activities	47.0
Organized or informal multi-age social recreation groups	18.0
Formal or informal social groups for aged	24.2
Service, fraternal, or legion organizations	12.1
Mass activities (e.g., bingo, community club)	16.2
Travel	37.0
Sports or games	34.1
Solitary	
Collecting hobbies	30.9
Handwork hobbies	45.9
Music, art, theatre	34.4
Reading or writing	89.9
Productive	
Work	8.4
Volunteer work	22.9
Light housework or gardening	95.3
Heavy housework or yard work	63.2

Table 3. Cross-Sectional Regression Results for Activity Level
(N = 2,291)

Predictors	β
Gender	.12***
Age	−.13***
Education	.00
Living alone	.03
Number of friends	.15***
IADLs	−.09***
ADLs	−.05*
Cognitive impairment	−.07***
Physical difficulties	−.12***
Poor self-rated health[a]	−.18***
Fair self-rated health[a]	−.20***
Good self-rated health[a]	−.11***
Morbidity	.08***
Life satisfaction	.15***

Notes: β = Standardized regression coefficient; ADLs = activities of daily living; IADLs = instrumental ADL.
[a]Compared to "excellent health."
*p < .05; ***p < .001.

related variables. Ordinary least squares regressions were calculated for life satisfaction and happiness; logistic regressions were used in the case of the dichotomous function and mortality variables. Hierarchical regressions were conducted, with sets of variables being forced into the regression model at each step. For the present purposes, only the final models are presented with all variables entered simultaneously. Second, a series of regressions were run with each of the activities entered separately into the model, controlling for all other variables assessed in 1990.

RESULTS

Preliminary Analyses

A preliminary analysis was conducted to examine cross-sectionally the factors associated with activity level. This analysis was based on all individuals who had complete responses to all relevant 1990 measures (N = 2,291). As Table 3 shows, being female, having more friends, greater morbidity, and greater life satisfaction were all positively related to activity, whereas age, functional dependence (ADL and IADL difficulties), cognitive impairment, physical difficulties, and poorer self-rated health were negatively related to activity.

Activity Level and Well-Being

Regression results for happiness and life satisfaction are shown in Table 4. Activity level was significantly related to feelings of happiness (β = .10, p < .001). In addition, cognitive impairment, poor self-rated health, and morbidity were negatively related to happiness. Higher life satisfaction in 1990 was related to greater happiness in 1996 (β = .17, p < .001).

In contrast, activity level was only marginally related to life satisfaction (β = .05, p = .074). Similar to the findings for

happiness, greater morbidity (β = −.13) and life satisfaction in 1990 (β = .36) were related to life satisfaction in 1996. In addition, higher education was related to greater life satisfaction.

Activity Level, Function, and Mortality

Table 5 shows logistic regression results for function and mortality. As can be seen in Table 5, activity level in 1990 predicted function 6 years later (adjusted odds ratio [AOR] = .93, p < .05). A supplementary analysis was subsequently conducted to examine whether activity predicted all four components of the composite function score. Separate regressions were therefore run with IADLs, ADLs, cognitive impairment, and physical difficulties as outcome variables, controlling for all other predictors. These analyses confirmed that activity was indeed related to all four variables: AOR = .94 (p < .01) for IADLs; AOR = .93 (p < .01) for ADLs; AOR = .86 (p < .001) for cognitive impairment; and AOR = .90 (p = .0001) for physical difficulties.

Table 5 further shows that older age, functional dependence (ADLs and IADLs), physical difficulties—the latter two being baseline variables of the function measure—and morbidity were all related to poorer function in 1996. That cognitive impairment in 1990 was not related to function was likely due to the fact that the function variable was more heavily weighted toward physical than cognitive function. The supplementary regressions conducted for each of the components of function (IADLs, ADLs, physical disability, and cognitive impairment) indeed indicated that cognitive impairment in 1990 was highly predictive of cognitive impairment in 1996 (AOR = 7.02, p < .001). Cognitive impairment was not related to ADLs, IADLs, and physical difficulties, however.

Activity level was also related to mortality (see Table 5). The odds of dying within 6 years of the initial interview were reduced for individuals with greater activity level (AOR = .95, p < .05). Being male, older, having IADL and ADL difficulties, cognitive impairment, physical difficulties, poor self-rated health (relative to excellent self-rated health), and greater morbidity all increased the odds of having died by 1996.

Table 4. Regression Results for Life Satisfaction and Happiness in 1996

Predictors (1990)	Happiness (*n* = 1,439)	Life Satisfaction (*n* = 1,208)
Gender	.03	−.01
Age	−.05	−.04
Education	.04	.06*
Living alone	−.01	.03
Number of friends	−.05	−.01
IADLs	−.03	−.02
ADLs	.02	.04
Cognitive impairment	−.08**	.00
Physical difficulties	.01	−.03
Poor self-rated health[a]	−.08*	−.05
Fair self-rated health[a]	−.08	−.05
Good self-rated health[a]	−.03	−.03
Morbidity	−.06*	−.13***
Life satisfaction	.17***	.36***
Activity	.10***	.05

Notes: Standardized regression coefficients are shown. ADLs = activities of daily living; IADLs = instrumental ADLs.

[a]Compared to "excellent health."

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

Table 5. Logistic Regression Results for Function in 1996 and 6-Year Mortality

Predictors (1990)	Function (*n* = 1,292)	Mortality (*n* = 2,291)
Gender	1.08	0.41***
Age	1.13***	1.09***
Education	1.01	1.02
Living alone	0.77	1.13
Number of friends	1.02	0.98
IADLs	2.55***	1.46**
ADLs	4.31***	1.65***
Cognitive impairment	1.92	1.38***
Physical difficulties	2.51***	1.42**
Poor self-rated health[a]	2.53	2.17**
Fair self-rated health[a]	1.08	1.28
Good self-rated health[a]	0.97	1.17
Morbidity	1.12**	1.06*
Life satisfaction	0.99	1.00
Activity	0.93*	0.95*

Notes: Adjusted odds ratio are shown (odds ratios >1 indicate increased odds of having poor function or having died). ADLs = activities of daily living; IADLs = instrumental ADLs.

[a]Compared to "excellent health."

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

Specific Activities and Well-Being

Next, a series of regressions was computed with each of the activities entered separately into the regression model, controlling for demographic variables, social support, IADLs, ADLs, cognitive impairment, physical difficulties, self-rated health, morbidity, and life satisfaction (see Table 6). Several activities were related to happiness, including social activities, namely participating in social groups for older adults and sports or games, more solitary activities (handwork hobbies, music/ art/theatre, and reading), and productive activities (light housework/gardening).

In contrast, only one activity — participating in sports or games — was related to life satisfaction (β = .07, *p* < .01). Individuals who engaged in sports or games reported greater life satisfaction than those who did not.

Specific Activities, Function, and Mortality

Participating in church-related activities and mass activities predicted better function 6 years later (see Table 6). Of the more solitary activities, only music/art/theatre was related to function, with individuals who engaged in this type of activity being less likely to function well than those who did not. Of the productive activities, volunteer work and heavy housework/ yardwork was predictive of better function in 1996.

In terms of mortality, individuals who engaged in church-related activities and light housework/gardening were less likely to have died 6 years later than those did not.

DISCUSSION

Consistent with activity theory (e.g., Lemon et al., 1972), the present findings show that overall activity level was positively related to happiness. Activity level was also related to better function and reduced mortality 6 years later. A number of significant effects also emerged when focusing on specific activities, although the pattern of findings differed depending on the specific outcome examined. Generally, social and productive activities were related to happiness as well as mortality,

consistent with previous research (e.g., Glass et al., 1999; Lennartson & Silverstein, 2001). Engaging in various social and productive activities was also related to reduced functional decline.

Few studies have examined the relation between activity and function. In contrast to the present findings, one study that looked at this issue over an 8-year period showed no significant relation (Markides & Lee, 1990). Markides and Lee's (1990) nonsignificant finding may have been due to their relatively small sample size, which may not have allowed sufficient statistical power to detect a relation between activity and functional status. Alternatively, these discrepant findings may, in part, be due to differences in study samples and/or specific measures used. For example, a more restricted range in the measures could have made detection of a relation more difficult.

Participation in several solitary activities was related to happiness in the present study, with individuals who engaged in handwork hobbies, music/art/theatre, or reading and writing being happier 6 years later than those who did not. No analogous association emerged for life satisfaction, function, and mortality, however. The evidence for the relation between solitary activities and well-being has been tenuous to date, with several studies finding no significant association (Longino & Kart, 1982; Litwin, 2000; Zimmer et al., 1995). One explanation for the lack of consistency in results may lie in the particular outcome measures used. In the present study, happiness was measured in terms of "happiness and interest in life," whereas previous studies have used more global life satisfaction or affect scales. It makes intuitive sense that reading the newspaper, writing letters, or listening to music would be related to a more specific measure that captures, in part, interest in life.

The different pattern of findings for social and productive activities on the one hand, and solitary activities on the other, raises broader questions as to the trajectories of different activities over the life span. As individuals experience declines

in various life domains, such as health, function, social relations and so forth, the importance and benefits of different activities likely change. Thus, as function declines, an individual who loved to garden may have to substitute that activity with less physically demanding ones, such as reading or listening to music. Similarly, the satisfaction gained from participating in social activities outside the home may later be derived from activities in the home, once traveling becomes too onerous. The developmental processes that allow successful adaptation to age-related losses have been described in detail by life-span theorists (Baltes, 1997; Heckhausen & Schulz, 1995). For example, Baltes' (1997) SOC (selection, optimization, and compensation) model focuses on compensatory mechanisms, whereby for instance new means are used to reach a goal when old means are no longer available, which become increasingly important in old age. Although research has documented the shifts in the kinds of activities people engage in as they age (e.g., Glass et al., 1995; Strain, Grabusic, Searle, & Dunn, 2002), how these changes relate to well-being and function will require further research.

As a more general issue, the question of what mechanisms underlie the relation between activity, well-being, function, and mortality is an important one that needs further exploration. A variety of mechanisms are likely involved. Activity theory suggests that participation in activities, particularly social activities, should provide opportunities for the role supports that are necessary for maintaining a positive self-concept (Lemon et al., 1972). Similarly, productive activities, such as housework or volunteer work may provide individuals with a sense of usefulness and competence (Herzog & House, 1991). They may also instill a sense of control and mastery (Glass et al., 1995), which is positively related to life satisfaction (Menec & Chipperfield, 1997b) and survival (Chipperfield, 1993; Menec & Chipperfield, 1997a). Moreover, activities like gardening have a physical component; the benefits of physical activity have been documented extensively (Blair, 1993; Kaplan, Strawbridge, Cohen, & Hungerford, 1996; Kujala, Kaprio, Sarna, & Koskenvuo, 1998). Determining which of these factors are most important in maintaining well-being and reducing declines in health and function is a task for future research.

The present findings further show that although activity level declined with age, older age was not correspondingly linked to less happiness. This was so even though function clearly also decreased with increasing age. In combination, these findings can be interpreted in terms of compensatory mechanisms that allow people to maintain psychological well-being when faced with age-related losses. It is noteworthy, however, that older adults in the present analysis were generally very active, with most of them engaging in many activities during a given week. This reflects the fact that the study included a relatively healthy sample, with less healthy and presumably therefore less active individuals who were too frail to answer questions themselves being excluded.

Although activity was related to happiness, neither overall activity level, nor specific activities (with the exception of sports/games) predicted life satisfaction, a finding that corroborates previous longitudinal research (Markides & Lee, 1990). It is noteworthy that cross-sectionally, life satisfaction and activity were significantly related in the present study,

Table 6. Regression Results for Happiness, Life Satisfaction, Function, and Mortality Assessed in 1996 With Individual Activity Items As Predictors

Activity (in 1990)	Happiness β (n = 1,439)	Life Satisfaction β (n = 1,208)	Function AOR (n = 1,292)	Mortality AOR (n = 2,291)
Social				
Church-related activities	.03	−.01	.71**	.82*
Mass activities (e.g., bingo)	.02	.04	.59**	1.18
Social groups for aged	.06*	.04	.81	1.00
Sports/games	.05*	.07**	.84	.97
Solitary				
Handwork hobbies	.05*	.02	.94	.91
Music, art, theatre	.06*	.03	1.33*	.97
Reading or writing	.06*	.01	.76	.80
Productive				
Volunteer work	.04	.01	.68*	.87
Light housework/ gardening	.06*	−.03	.96	.59**
Heavy housework/ yardwork	.03	−.03	.72*	.82

Notes: Only activities with at least one significant effect are shown. Gender, age, education, IADLs, ADLs, cognitive impairment, physical difficulties, self-rated health, morbidity, and life satisfaction are controlled for in all analyses. ADLs = activities of daily living; IADLs = instrumental ADL; β = standardized regression coefficient; AOR = adjusted odds ratio (odds ratios >1 indicate increased odds of having poor function or having died).
*p < .05; **p < .01.

consistent with other cross-sectional research (e.g., Markides & Martin, 1979). The inconsistency between cross-sectional and longitudinal analyses may suggest that life satisfaction is a precursor, rather than a consequence of activity. Alternatively, it is also possible that the benefits of activity are not direct, but rather mediated by other processes, such as the maintenance or enhancement of self-concept (Lemon et al., 1972).

The finding that activity was related to happiness, but not life satisfaction warrants some discussion. On the one hand, this may represent a "real" finding and suggest that the benefits of activity are very specific and cannot be captured with a global life satisfaction measure. On the other hand, it may suggest potential limitations of the measures. Although the LSIA (Neugarten et al., 1961) used in the present study is a well-established instrument, it is not entirely clear what it measures given that it is multidimensional in nature. Similarly, the measure of happiness used here is also not without its problems. Only a single-item measure was available in the database and the reliability of the measure might therefore be lower than one would wish. This highlights one of the problems with analyzing existing data, particularly large studies, where constructs are not always assessed in detail.

Two additional limitations of the present study should be acknowledged at this point. The first one pertains to the activity index. Participants were simply asked whether they participated in each of the activities within the past week. There was no assessment of the frequency of the activity, nor of the time spent on each activity. Important questions as to whether the frequency of activity participation and duration make a differ-

ence can therefore not be answered. For instance, is tending a garden for 5 minutes each week the same as gardening an hour each day? Similarly, the activity scale occasionally combines several activities into one item, making it impossible to examine the effect of each activity listed. For example, light housework and gardening are part of one item. The former might be considered an obligatory activity and gardening potentially a "desire" activity (cf. Reich, Zautra, & Hill, 1987), each of which might have potentially different consequences. Teasing apart such more specific effects is an important task for future research and will require more detailed assessment of activity participation.

Second, a cautionary note is warranted in terms of interpreting the causal directions of the findings. It is possible that engaging in certain types of activities is causally linked to well-being, function, and mortality. For example, engaging in volunteer work might afford a level of physical and mental exercise that helps to slow functional decline. However, it is also possible that people who engaged in certain activities were in better health than those who did not. Being able to attend church-related activities, for instance, requires considerable physical and mental effort. Although functional status and health status were controlled for in the analyses, it is not possible to determine whether certain activities might reflect aspects of health and function that were simply not captured with any of the other variables in the regression model. Thus, which one of these opposing interpretations holds cannot be determined from the present study.

The unexpected finding that participating in music, art, or theatre increased the odds of poor function might be interpreted in this light. For instance, listening to music may reflect a degree of functional decline not captured with the ADL and IADL measures. Thus, individuals who engaged in this activity may have done so because they were no longer able to participate in more physical activities. To determine whether this is the case would require more information on the specific nature of participants' activity participation. For example, listening to music differs considerably from attending concerts in the degree of functional capacity required. Alternatively, this unusual finding may simply reflect a Type 1 error.

Although limitations of a study need to be acknowledged, the strengths of the present research should also be highlighted. These include the longitudinal nature of the Aging in Manitoba database and the use of a large, representative sample of older adults.

In sum, the present findings contribute to the literature by showing that greater activity is related not only to greater well-being but also to reduced functional decline and reduced mortality over a 6-year time span. Moreover, the study suggests that different types of activities can have different benefits. Although engaging in social and productive activities appears to have wide-ranging benefits, being related to greater well-being, reduced functional decline and reduced mortality, the potential benefits of more solitary activities may be restricted to psychological well-being.

Address correspondence to Verena H. Menec, Department of Community Health Sciences, The University of Manitoba, Winnipeg, Manitoba, R3E 0W3, Canada. E-mail: verena_menec@cpe.umanitoba.ca

REFERENCES

Baltes, P. B. (1997). On the incomplete architecture of human ontogeny: Selection, optimization, and compensation as foundation of developmental theory. *American Psychologist, 52*, 366–380.

Baltes, P. B., & Baltes, M. M. (1990). *Successful aging: Perspectives from the behavioral sciences.* Cambridge, England: Cambridge University Press.

Beck, S. H., & Page, J. W. (1988). Involvement in activities and the psychological well-being of retired men. *Activities, Adaptation, and Aging, 11*, 31–47.

Blair, S. N. (1993). Physical activity, physical fitness, and health. *Research Quarterly for Exercise and Sport, 64*, 365–376.

Branch, L. G., Katz, S., Kniepman, K., & Papsidero, J. A. (1984). A prospective study of functional status among community elders. *American Journal of Public Health, 74*, 35–49.

Branch, L. G., & Meyers, A. R. (1987). Assessing physical function in the elderly. *Clinics in Geriatric Medicine, 3*, 29–51.

Burgess, E. W. (1954). Social relations, activities, and personal adjustment. *American Journal of Sociology, 59*, 352–360.

Chipperfield, J. G. (1993). Perceived barriers in coping with health problems: A twelve-year longitudinal study of survival among elderly individuals. *Journal of Aging and Health, 5*, 123–139.

Chipperfield, J. G., Havens, B., & Doig, W. (1997). Methods and description of the Aging in Manitoba Project: A 20-year longitudinal study. *Canadian Journal on Aging, 16*, 606–625.

Everard, K. M., Lach, H. W., Fisher, E. B., & Baum, M. C. (2000). Relationship of activity and social support to the functional health of older adults. *Journal of Gerontology: Social Sciences, 55B*, S208–S212.

Garfein, A. J., & Herzog, A. R. (1995). Robust aging among the young-old, old-old, and oldest-old. *Journal of Gerontology: Social Sciences, 50B*, S77–S87.

Glass, T. A., De Leon, C. M., Marottoli, R. A., & Berkman, L. F. (1999). Population based study of social and productive activities as predictors of survival among elderly Americans. *British Medical Association Journal, 319*, 478–482.

Glass, T. A., Seeman, T. E., Herzog, A. R., Kahn, R., & Berkman, L. F. (1995). Change in productive activity in late adulthood: MacArthur Studies of Successful Aging. *Journal of Gerontology: Social Sciences, 50B*, S65–S76.

Havighurst, R. J. (1961). Successful aging. *The Gerontologist, 1*, 4–7.

Havighurst, R. J., & Albrecht, R. (1953). *Older people.* New York: Longmans.

Heckhausen, J., & Schulz, R. (1995). A life-span theory of control. *Psychological Review, 102*, 284–304.

Herzog, A. R., Franks, M. M., Markus, H. R., & Holmberg, D. (1998). Activities and well-being in older age: Effects of self-concept and educational attainment. *Psychology and Aging, 13*, 179–185.

Herzog, A. R., & House, J. S. (1991). Productive activities and aging well. *Generations, 15*, 49–54.

Idler, E. L., & Kasl, S. V. (1991). Health perceptions and survival: Do global evaluations of health status really predict mortality? *Journal of Gerontology: Social Sciences, 46*, S55–S65.

Kahn, R. L., Goldfarb, A. I., Pollack, M., & Peck, A. (1960). Brief objective measures for the determination of mental status in the aged. *American Journal of Psychiatry, 117*, 326–328.

Kaplan, G. A., Strawbridge, W. J., Cohen, R. D., & Hungerford, L. R. (1996). Natural history of leisure-time physical activity and its correlates: Associations with mortality from all causes and cardiovascular disease over 28 years. *American Journal of Epidemiology, 144*, 793–797.

Katz, S., Ford, A. B., Moskowitz, R. W., Jackson, B. A., & Jaffee, M. W. (1963). Studies of illness in the aged. The index of ADL: A standardized measure of biological and psychosocial function. *Journal of the American Medical Association, 185*, 914–919.

Keith, P. M. (1980). Life changes, leisure activities, and well-being among very old men and women. *Activities, Adaptation, and Aging, 1*, 67–75.

Kujala, U. M., Kaprio, J., Sarna, S., & Koskenvuo, M. (1998). Relationship of leisure-time physical activity and mortality: The Finnish twin cohort. *Journal of the American Medical Association, 279*, 440–444.

Lawton, M. P., Winter, L., Kleban, M. H., & Ruckdeschel, K. (1999). Affect and quality of life: Objective and subjective. *Journal of Aging and Health, 11*, 169–198.

Lee, D. J., & Markides, K. S. (1990). Activity and mortality among aged persons over an eight-year period. *Journal of Gerontology: Social Sciences, 45*, S39–S42.

Lemon, B. W., Begtson, V. L., & Peterson, J. A. (1972). An exploration of the activity theory of aging: Activity types and life satisfaction among in-movers to a retirement community. *Journal of Gerontology, 27*, 511–523.

Lennartsson, C., & Silverstein, J. (2001). Does engagement with life enhance survival of elderly people in Sweden? The role of social and leisure activities. *Journal of Gerontology: Social Sciences, 56B*, S335–S342.

Litwin, H. (2000). Activity, social network, and well-being: An empirical examination. *Canadian Journal on Aging, 19*, 343–362.

Longino, C. F., & Kart, C. S. (1982). Explicating activity theory: A formal replication. *Journal of Gerontology, 37*, 713–722.

Markides, K. S., & Lee, D. J. (1990). Predictors of well-being and functioning in older Mexican Americans and Anglos: An eight-year follow-up. *Journals of Gerontology: Social Sciences, 45*, S69–S73.

Markides, K. S., & Martin, H. W. (1979). A causal model of life satisfaction among the elderly. *Journal of Gerontology, 34*, 86–93.

Menec, V. H., & Chipperfield, J. G. (1997a). The interactive effects of perceived control and functional status on health and mortality among the young-old and old-old. *Journal of Gerontology: Psychological Sciences, 52B*, P118–P126.

Menec, V. H., & Chipperfield, J. G. (1997b). Remaining active in later life: The role of locus of control in older adults' leisure activity participation, health, and life satisfaction. *Journal of Aging and Health, 9*, 105–125.

Morgan, K., Dallosso, H., Bassey, E. J., Ebrahim, S., Fentem, P. H., & Arie, T. H. D. (1991). Customary physical activity, psychological well-being, and successful aging. *Ageing and Society, 11*, 399–415.

Neugarten, B. L., Havighurst, R. J., & Tobin, S. S. (1961). The measurement of life satisfaction. *Journal of Gerontology, 15*, 134–143.

Okun, M. A., Stock, W. A., Haring, M. J., & Witter, R. A. (1984). The social activity/subjective well-being relation. *Research on Aging, 6*, 45–65.

Palmore, E. (1979). Predictors of successful aging. *The Gerontologist, 19*, 427–431.

Reich, J. W., Zautra, A. J., & Hill, J. (1987). Activity, event transactions, and quality of life in older adults. *Psychology and Aging, 2*, 116–124.

Roos, N. P., & Havens, B. (1991). Predictors of successful aging: A twelve-year study of Manitoba elderly. *American Journal of Public Health, 81*, 63–68.

Rowe, J. W., & Kahn, R. L. (1997). Successful aging. *The Gerontologist, 37*, 433–440.

Scarmeas, N., Levy, G., Tank, M. X., Manly, J., & Stern, Y. (2001). Influence of leisure activity on the incidence of Alzheimer's disease. *Neurology, 57*, 2236–2242.

Stones, M. J., Dornan, B., & Kozma, A. (1989). The prediction of mortality in elderly institution residents. *Journal of Gerontology: Psychological Sciences, 44*, P72–P79.

Strain, L. A., Grabusic, C. C., Searle, M. S., & Dunn, N. J. (2002). Continuing and ceasing leisure activities in later life: A longitudinal study. *The Gerontologist, 42*, 217–223.

Wilson, R. S., Mendes de Leon, C. F., Barnes, L. L., Schneider, J. A., Bienias, J. L., & Evans, D. A., et al. (2002). Participation in cognitively stimulating activities and risk of incident Alzheimer disease. *Journal of the American Medical Association, 287*, 742–748.

Wolinsky, F. D., & Johnson, R. J. (1992). Perceived health status and mortality among older men and women. *Journal of Gerontology: Social Sciences, 47*, S304–S312.

Zimmer, S., Hickey, T., & Searle, M. S. (1995). Activity participation and well-being among older people with arthritis. *The Gerontologist, 35*, 463–471.