Risk and Protective Factors for Physical Functioning in Older Adults With and Without Chronic Conditions: MacArthur Studies of Successful Aging

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Objectives. Older age continues to be seen as a period of declining health and functioning. The inevitability of declines, however, may be exaggerated, including declines for those with chronic health conditions.

Methods. Data from the MacArthur Study of Successful Aging were used to examine the impact of sociodemographic, health status, health behavior, and social and psychological factors on patterns of change in physical functioning over a 2.5-year interval for groups of older adults reporting prevalent hypertension, diabetes, cardiovascular disease, cancer, or fractures, and those reporting no chronic conditions at baseline.

Results. Findings from multiple regression analyses revealed a consistently protective effect of regular physical activity with respect to patterns of change in physical functioning in nearly all groups. For those with cardiovascular disease, greater emotional support was associated with higher baseline levels and less declines in functioning, whereas greater social conflict was associated with greater decline among those with hypertension or diabetes. For those with a history of cancer, instrumental self-efficacy beliefs were protective, whereas lower psychological symptomatology was associated with less risk of decline among those with a history of fracture. Social and psychological factors were unrelated to changes in functioning for those with no chronic conditions.

Discussion. These findings suggest that risks for decline in physical functioning are influenced by a number of potentially modifiable factors that could be targets for interventions to promote better functioning, even among older adults with various types of chronic conditions.

Older age continues to be seen largely as a period of declining health and functioning. However, the past decade has seen a renewed attention to the fact that such declines may not be inevitable and are certainly not experienced uniformly by all older adults (Butler & Gleason, 1985; Rowe & Kahn, 1987, 1998). As a growing body of research attests, risks for declines in health and functioning at older ages are influenced by lifestyle characteristics, including differences in levels of physical activity, as well as levels of social engagement and psychological characteristics (Albert et al., 1995; Seeman et al., 1995; see also Seeman, 1994, for review).

Identification of factors such as these that influence risks for functional disability is of growing importance in light of current population trends that are projected to result in a population of adults aged 65 years and older of some 39 million in the next 15 years and a population of more than 80 million by 2050 (U.S. Census, 1996). Because risks for functional disabilities rise with age, there is considerable debate about whether this growing population of older adults will be characterized by a compression of morbidity (i.e., with disease and disability postponed to later ages) or whether people will simply live longer with greater burdens of disease and disability (Fries & Crapo, 1981; Guralnik & Schneider, 1987).

One area of particular interest relates to the question of whether the presence of major chronic health conditions—such as diabetes, hypertension (high blood pressure [HBP]), heart disease, cancer, or broken bones—is necessarily associated with declines in functioning. This question is of particular significance at older ages, because the risks for such chronic conditions increase significantly with increasing age so that older adults are at relatively higher risk of experiencing one or more such conditions. The majority of research on models of physical functioning at older ages has focused on analyses of the older population as a whole, adjusting for differences in health status (i.e., presence of various health conditions) when examining the impact of other lifestyle and demographic factors. Studies that have directly compared levels of functioning for those with and without chronic conditions have shown that chronic medical conditions have a negative association with levels of physical functioning (Stewart et al., 1989; Verbrugge & Patrick, 1995). Studies have also documented differences in lifestyle and psychosocial characteristics, such as exercise, smoking, depression, and self-efficacy across groups characterized by differences in health status (Ormel et al., 1997; Penninx et al., 1998). However, with the exception of a few studies of rheumatoid arthritis (RA), there has been little attention to the potential influence of individual differences in such factors on within-group variations in levels of functioning for those with chronic conditions.

Studies of RA have shown that social and psychological...
factors predict differences in functional disability—being married, having a larger social network, and/or reporting receiving more emotional support—with each having been found to predict better levels of functioning (Verbrugge, Gates, & Ike, 1991) and less decline in functioning (Brown, Wallston, & Nicassio, 1989; Evers, Kraaimaat, Geenen, & Bijlsma, 1998; Leigh & Fries, 1992; Ward & Leigh, 1993). In both RA and chronic obstructive pulmonary disease, beliefs about the controllability of the disease have also been found to predict better functioning (Narsavage, 1997; Scharloo et al., 1998). A small group of literature also suggests that social integration and/or social support protect against functional declines poststroke (Colantonio, Kasl, Ostfeld, & Berkman, 1993; Glass & Maddox, 1992).

In this study, we explore the general hypothesis that lifestyle and psychosocial factors that have been shown to influence risks for functional decline in the general population of older adults are consequential for population subgroups characterized by the presence of chronic conditions. Factors hypothesized to protect against functional declines include higher socioeconomic status (i.e., more education and/or income), participation in regular physical activity, greater social engagement with others, and more positive psychological characteristics, such as stronger self-efficacy beliefs and fewer symptoms of psychological distress. Using data for a 2.5-year follow-up, we test the hypothesis that such lifestyle, demographic, and psychosocial factors influence risks for declines in physical functioning over time within groups of older adults characterized by the presence of HBP, diabetes, cardiovascular disease (CVD), cancer, and broken bones. We also examine the impact of such factors on changes in functioning within a subgroup of adults reporting no chronic conditions.

**Methods**

Data for these analyses come from the MacArthur Successful Aging Study, a longitudinal study of relatively high functioning men and women aged 70–79. As described in greater detail elsewhere (Berkman et al., 1993), participants were subsampled on the basis of age and both physical and cognitive functioning from three community-based cohorts in Durham, NC, East Boston, MA, and New Haven, CT, that were part of the National Institute on Aging’s Established Populations for Epidemiologic Studies of the Elderly (Crononi-Huntley, Brock, Ostfeld, Taylor, & Wallace, 1986). Age was restricted to 70–79 years, and age-eligible men and women (N = 4,030) were screened on the basis of four criteria of physical functioning and two criteria of cognitive functioning to identify those functioning in the top third of the age group. The selection criteria included: (1) no reported disability on the 7-item Activities of Daily Living Scale (Katz, Ford, Moskowitz, Jackson, & Jaffe, 1963); (2) no more than one reported mild disability on 8 items tapping gross mobility and range of motion (Nagi, 1976; Rosow & Breslau, 1966); (3) ability to hold a semitandem balance for at least 10 s; (4) ability to stand from a seated position 5 times within 20 s; (5) scores of six or more correct on the 9-item Short Portable Mental Status Questionnaire (Pfeiffer, 1975); and (6) ability to remember three or more of six elements on a delayed recall of a short story.

Of the 4,030 age-eligible men and women, a cohort of 1,313 persons met all screening criteria; 1,189 (90.6%) agreed to participate and provided informed consent. Base-line data collection was completed between May 1988 and December 1989, and included a 90-min, face-to-face interview covering detailed assessments of physical and cognitive functioning, health status, and social and psychological characteristics, as well as other lifestyle characteristics.

The cohort was reinterviewed in 1991–1992, with reassessments of all measures included in the baseline interview. A majority of the cohort was interviewed between 24 and 32 months after their baseline interview (X = 28 months). Attrition was minimal: there were 1,066 (90%) completed interviews, 59 (5%) partial or proxy interviews, 47 (4%) refusals at follow-up, and 71 (6%) deaths.

**Prevalence of Chronic Conditions**

Self-report data on the prevalence of five major chronic conditions (HBP, diabetes, CVD [= heart attack or stroke], cancer, and fractures) were examined, because these were the conditions with sufficient numbers of prevalent cases to permit within-group analysis of factors associated with patterns of change in physical functioning (HBP, n = 563; diabetes, n = 155; CVD, n = 154; cancer, n = 213; fractures, n = 291). Selection of these conditions for analysis was also based on available evidence, indicating that self-reports for these conditions are generally accurate (e.g., %agreement of .86 or higher and kappas of .70 or higher, compared with medical records; Bush, Miller, Golden, & Hale, 1989; Walker, Whincup, Shaper, Lennon, & Thomson, 1998). Participants were classified as having the condition in question if they responded affirmatively to the question of whether a doctor had ever told them that they had “x.” Persons reporting more than one condition (e.g., diabetes and CVD) were classified into each of the disease groups for which they indicated an affirmative response so that each disease group reflects all participants who reported that condition. Analyses examined all those reporting a given condition (i.e., whether they also report other comorbid conditions), with adjustments for comorbidity, because small numbers of cases precluded analyses stratified by number of comorbid conditions or the presence of a single condition. Those with no reported chronic conditions (n = 310) were also examined as a group.

**Physical Functioning**

A summary measure of physical functioning, based on five separate tests of physical ability, was used as the primary outcome. Details regarding creation of this summary scale are available elsewhere (Seeman, Charpentier, et al., 1994). The five abilities assessed included timed measures of balance, gait, chair stands, foot taps, and manual ability. Two-month test–retest data for these protocols indicate that they have generally good reliability, ranging from .61 (balance) to .91 (signature). A summary measure of physical functioning ability was developed by summing scores for the five subscales. Because the ranges for the timed scores varied between the five subscales, scores for each of the subscales were rescaled to a range of 0–1 before summing them; rescaling for the five subscales was accomplished by
dividing the individual’s raw score by the maximum value from the 1988 (baseline) distribution. For all tests except balance, higher timed scores indicated worse performance; for these tests, the results of the division were also subtracted from one to reverse the order of scores so that higher scores would reflect better performance. The rescaled scores thus range from 0 (worst) to 1 (best), and represent the proportion of the best possible score that the individual achieved. This summary score had a 2-month test–retest reliability of .80. The 1991 (follow-up) timed scores were also rescaled using the 1988 denominators to permit meaningful evaluation of change over time (i.e., to ensure that changes in rescaled scores on a test reflected actual change in the timed score [numerator of rescaled score] rather than a change in the denominator of the rescaled score). Summary measures of functioning in 1988 and 1991 were created by adding the rescaled subscale scores for the respective years (range each year = 0–5). Although there is no “gold standard” against which to validate this measure, evidence for its construct validity is provided by its significant correlation with self-reported functional status and its apparent sensitivity to changes in health status (e.g., increased morbidity and/or hospitalization have been shown to predict declines in functioning scores; Seeman, Charpentier, et al., 1994). Change in functioning from 1988 to 1991 is measured as the difference (1991 score – 1988 score) so that negative scores reflect declines in functioning from baseline to follow-up.

Sociodemographic Characteristics

Information was available regarding gender, ethnicity, age, education, and income. Ethnicity was coded White versus African American. Education was measured initially as the number of years of schooling completed. For the analyses presented here educational attainment was classified as “less than high school” versus “high school or higher,” because this categorization has been shown to have the strongest relationship to physical functioning and change in functioning (Seeman et al., 1995). Based on these earlier analyses, annual household income (originally measured in $10,000 increments to “$30,000+”) was classified as “< $10,000” versus “$10,000 or more.” A second dummy indicator variable was also included for “missing income data” to retain these latter individuals in the analyses.

Behavioral Factors

Levels of physical activity were assessed based on self-reported frequency of current leisure- and work-related activities. Each activity mentioned was classified as light, moderate, or strenuous based on intensity codes (kcal/min) adapted from Paffenbarger, Hyde, Wing, and Hsieh (1986) and Taylor and colleagues (1978). Summary scales were derived by multiplying the frequency of activity (five categories, ranging from never to 3+ times per week) by the intensity code and summing over all activities within a given category of intensity. For the results reported here, measures of the amount of moderate and strenuous activity were examined both individually, as well as in combination (i.e., doing moderate and/or strenuous activity). In addition to the continuous measures of the amount of activity, dichotomous variables were created to allow for assessment of more specific effects of any activity versus no such activity. We report results for the continuous measure of “amount of strenuous activity” and for the dichotomous indicator of “any versus no moderate or strenuous activity,” because these were the only two measures found to relate significantly to measured physical functioning. Cigarette smoking was assessed by self-report, and participants were classified as current, former, or never smokers as of their 1988 baseline interview. For past and current smokers, pack-years of smoking were calculated. Alcohol consumption was assessed in terms of the monthly frequency and quantity of beer, wine, and hard liquor consumption. A summary measure of ethyl alcohol consumption was created based on the quantity and frequency of each type of alcohol consumed (Armor, Polich, & Stambul, 1975).

Social Network Characteristics

Details regarding the various scales developed from the MacArthur Battery assessments of network characteristics have been reported elsewhere (Seeman, Berkman, Blazer, & Rowe, 1994). Briefly, four major indices were developed, including: (1) a summary measure of social network ties, representing the total number of children, close friends, and relatives reported by the respondent (the presence or absence of a spouse was measured separately); (2) a measure of emotional support, reflecting how often (range = 0 [never] to 3 [frequently]) members of the respondent’s social network made the respondent “feel loved and cared for” and how often they “listen to you when you needed to talk about worries or a problem” (scale score based on an average of responses to 6 items reflecting spousal support [2 items], support from children [2 items], and support from close friends/relatives [2 items]); (3) a summary measure of instrumental support was based on the average reported frequency (range = 0 [never] to 3 [frequently]) with which network members “helped with daily tasks” and “provided information about medical, financial, or family problems” (scale score is based on an average of responses to 6 items reflecting reported spousal assistance [2 items], assistance from children [2 items], and assistance from close friends/relatives [2 items]; and (4) a summary measure of more negative aspects of social relationships. The latter measure reflected respondents’ reports as to the frequency with which their spouse, children, friends, and relatives “made too many demands on you” or “were critical of what you do.” A summary measure of demands/criticism was constructed based on the average reported frequency of such interactions across network ties (average of 6 items; range = 0 [never] to 3 [frequently]).

Psychological Characteristics

Self-efficacy beliefs were measured based on participants’ perceptions of their own self-efficacy in nine separate life domains found to be of particular relevance to older adults (Rodin & McAvay, 1992). In addition to a summary scale, two subscales were examined—one subscale reflected interpersonal efficacy beliefs relating to one’s ability to deal with interpersonal relationships with spouse, children/relatives, and friends, whereas the second subscale reflected instrumental efficacy beliefs relating to one’s perceived ability to
deal with instrumental tasks relating to finances, transportation, one’s living situation, and one’s sense of being productive (see Seeman, Rodin, & Albert, 1993, for additional details of scaling). Personal mastery beliefs were measured using a scale developed by Pearlin and Schooler (1978). Psychological “symptomatology” was measured by a 50-item version of the Hopkins Symptom Checklist (Derogatis, Lipman, Rickels, Uhlenhuth, & Covi, 1974); a subscale measuring depressive symptoms was also examined separately.

Health Status Measures

In addition to the information on prevalent chronic conditions used to classify participants into analysis groups, data were available on measured blood pressure, pulmonary function, relative weight, and cognitive function, as well as medication use. Pulmonary function (peak expiratory flow rate) was assessed using a mini-Wright meter (Cook et al., 1991). Relative weight was examined in terms of body mass index (BMI; kg/m²) from self-reported height and weight, as well as waist-hip ratio, based on measured waist circumference (at the umbilicus) and hip circumference (maximal buttocks; Lohman, Roche, & Martorell, 1988). Blood pressure was assessed according to the Hypertension Detection and Follow-up Program Cooperative Group protocol, using the average of the second and third of three seated readings (HDFP, 1978); the presence of high systolic was defined as systolic blood pressure ≥140 mm Hg, and high diastolic was defined as diastolic blood pressure ≥90 mm Hg. Cognitive functioning was measured by summing scores on tests measuring memory, abstraction, spatial recognition, and spatial (copying) ability (Inouye, Albert, Mohs, Sun, & Berkman, 1993). Information on medication use was also available based on self-reports and interviewer observation of pill bottles; a single indicator of any medication use (yes/no) was used in the final analyses. To evaluate the potential impact of comorbidity, indicator variables for each type of prevalent condition were examined (i.e., myocardial infarction [MI], stroke, diabetes, HBP, cancer, broken bones). Additional indicator variables were also included reflecting the onset of any of these conditions during the 1988–1991 follow-up period.

Analyses

Data were analyzed using the SAS System version 6.12 for Windows (SAS Institute, Inc., 1996) on a personal computer. Univariate analyses were conducted first to examine basic statistical characteristics of all variables. Descriptive statistical analyses were conducted to estimate means and standard deviations (for continuous variables) and percentages (for dichotomous variables) for groups characterized by the presence of different chronic conditions. To test for relationships between baseline characteristics and changes in physical functioning, residualized change scores were examined (i.e., change in functioning measured as the difference in functioning scores [1991 − 1988 (baseline)], adjusted for baseline physical functioning; Menard, 1991). Multiple regression analyses with backward selection based on the full set of potential risk factors were conducted for each of the chronic condition groups (as well as the group without chronic conditions) to identify risk factors that made significant, independent contributions (p ≤ .05) to observed differences in patterns of change in physical functioning. Because analyses of change are subject to concerns regarding the extent to which measured changes reflect “real” change versus measurement error (e.g., regression to the mean or other unreliability effects), we also examined a series of logistic regression models in which individuals in the bottom third (most negative) of all change scores were compared with everyone else. The criterion for defining “decline” was based on an adaptation of the Reliable Change Index developed by Hageman and Arrindell (1993, 1999). Using information on change scores and the reliability of those scores (calculated based on our test–retest reliability data for the physical functioning measure), a “reliable change” score is calculated, indicating whether an individual’s change score can be reliably classified as “declined,” “improved,” or “no reliable evidence of change.” Logistic regression models were used to evaluate the extent to which the same factors seen in the linear regression models would be found to predict “decliners” versus others.

Examination of the potential impact of missing data yielded little evidence for such effects. At baseline, there was very little missing data (89% of cohort had complete data). Those excluded because of missing data on one or more variables had somewhat lower physical and cognitive functioning scores and were less likely to report any regular physical activity. There were no differences in exclusion rates based on the presence or absence of chronic conditions. For the longitudinal data, 81% of the cohort had complete data. Those excluded because of missing data on 1991 physical functioning were more likely to be non-White and to have missing income information from baseline, and they also had poorer lung function at baseline. Mortality between 1988 and 1991 accounted for 22% of those with missing longitudinal outcome data.

Results

Table 1 presents descriptive information, showing the sociodemographic, health status, health behavior, and social and psychological characteristics for each of the chronic condition groups, compared with those reporting no such conditions. As shown, those with prevalent chronic conditions differed from those reporting no chronic conditions with respect to sociodemographic, behavioral, and psychosocial characteristics. There were proportionately more men in the prevalent CVD group, whereas the fracture group had proportionately fewer men; the prevalent CVD group also had proportionately fewer subjects who completed high school, as did the HBP and diabetes groups. Those with a history of HBP were significantly more likely to be African American, whereas those with a history of cancer were significantly less likely to be African Americans.

Those with prevalent chronic conditions, particularly those with a history of HBP, diabetes, or prevalent CVD, also exhibited generally poorer health status and health behavior profiles than those with no reported conditions. Comorbidity patterns, however, were generally similar across the various disease groups, with HBP being the most commonly reported other condition. The incidence of new conditions was generally low (6% or less).
In terms of health behaviors, those with CVD, although they were less likely to be current smokers, reported significantly greater pack-years of prior smoking. By contrast, those with diabetes were less likely to be current smokers and reported significantly fewer pack-years of smoking; they also reported significantly less strenuous physical activity. Those with a history of cancer differed from those with no reported conditions only with respect to smoking.
A factor that is the focus of analyses reported herein. The unity within groups in the patterns of change in functioning—significant, largely as a result of the considerable heterogeneity among persons with diabetes.

With respect to our outcome of interest—physical functioning—those with no reported chronic conditions exhibited better physical functioning at baseline ($M = 2.85, SD = 0.45$) than those with a history of HBP, diabetes, CVD, or a history of fracture (see Table 2). Those reporting a history of diabetes and those with a history of fracture exhibited the poorest functioning ($M = 2.693, SD = 0.48$ and $M = 2.699, SD = 0.57$, respectively). With respect to patterns of change in physical functioning from 1988 to 1991, differences in mean change scores between groups with and without chronic conditions were generally not statistically significant, largely as a result of the considerable heterogeneity within groups in the patterns of change in functioning—a factor that is the focus of analyses reported herein. The one exception was for persons with diabetes: they exhibited the largest declines ($M = -0.121, SD = 0.55$); and these declines were significantly greater than those seen for the group with no conditions. Those with prevalent CVD exhibited the next largest declines ($M = -0.06, SD = 0.52$), followed by those with HBP ($M = -0.047, SD = 0.52$), although these declines were not significantly different from declines seen among those with no conditions.

Factors Affecting Longitudinal Patterns of Change in Physical Functioning

Stepwise, backward multiple regression analyses were conducted to identify factors associated with differences in patterns of change in physical functioning over a 2.5-year interval. For each of the disease groups (and those with no conditions), the full set of potential predictors was entered initially in each model; predictors with $p \leq .05$ were retained in the final models (see Table 3). Among subjects with no prevalent conditions, those showing less decline were characterized by higher incomes, higher initial levels of cognitive functioning, absence of high systolic blood pressure, and better health habits as reflected by reports of engaging in some regular moderate and/or strenuous physical activity; these effects were independent of baseline physical functioning. Baseline physical functioning was also a predictor of decline: higher baseline functioning predicted greater decline by 1991.

Examination of the pattern of predictors for the five groups reporting prevalent chronic conditions at baseline revealed two notably consistent effects. One finding was the effect of initial levels of physical functioning with higher initial physical functioning predicting greater decline at follow-up in all groups. The other consistent finding was the protective effect of regular physical activity for three of the five chronic condition groups. Among participants with prevalent CVD, those reporting greater amounts of regular strenuous activity showed less decline in functioning. Among those with HBP or a history of cancer, the dichotomous designation of any versus no regular moderate or strenuous leisure activity was associated with lower risks for decline.

The various prevalent condition groups showed greater variation with respect to the sociodemographic, health status, and social and psychological factors that were related to change in physical functioning. Among those with HBP, less decline was seen in younger individuals, those with better cognition, and better lung function, as well as lower BMI and less reported conflict with others; use of medications was associated with better functioning. Not surprisingly, the onset of conditions such as MI, stroke, or fracture was also associated with greater decline. Among persons with diabetes, those showing less decline tended to be men and reported use of medications. Persons with diabetes and a history of fracture were more likely to decline. Like those with HBP, persons with diabetes reporting greater social conflict with others exhibited more decline over time. Among those with prevalent CVD, less decline was seen among those with better baseline lung function and those reporting greater emotional support from others. Incident fractures in this group were also marginally associated with greater declines ($p = .06$). Among those with a history of cancer, less decline was seen in those characterized by younger age, higher income, no smoking, and less alcohol consumption. Instru-

<table>
<thead>
<tr>
<th>Performance Year</th>
<th>No Chronic Conditions ($n = 254$)</th>
<th>History of Hypertension ($n = 452$)</th>
<th>History of Diabetes ($n = 125$)</th>
<th>History of Cardiovascular Disease ($n = 119$)</th>
<th>History of Cancer ($n = 172$)</th>
<th>History of Bone Fracture ($n = 230$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988</td>
<td>2.852 (0.45)</td>
<td>2.717 (0.53)***</td>
<td>2.693 (0.46)***</td>
<td>2.713 (0.57)*</td>
<td>2.805 (0.47)</td>
<td>2.699 (0.57)***</td>
</tr>
<tr>
<td>1991</td>
<td>2.843 (0.57)</td>
<td>2.670 (0.63)***</td>
<td>2.572 (0.63)***</td>
<td>2.653 (0.71)**</td>
<td>2.850 (0.52)</td>
<td>2.686 (0.65)**</td>
</tr>
<tr>
<td>Change in 1991 – 1988 score</td>
<td>-0.009 (0.48)</td>
<td>-0.047 (0.52)</td>
<td>-0.121 (0.55)*</td>
<td>-0.060 (0.52)</td>
<td>0.044 (0.48)</td>
<td>-0.013 (0.49)</td>
</tr>
</tbody>
</table>

Note: When compared with those reporting no chronic conditions: *$p < .05$; **$p < .01$; ***$p < .001$. 

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Table 2. Descriptive Data on Levels of Physical Functioning and Changes in Physical Functioning (From 1988 to 1991) by the Chronic Condition Group
mental efficacy beliefs were also associated with less decline. Those reporting greater comorbidity (i.e., HBP, diabetes, or fractures) were more likely to decline. Among those with a history of fracture, factors associated with less likelihood of decline in functioning included absence of high systolic blood pressure or diabetes, and less psychological symptomatology at baseline.

Because analyses of change such as those reported previously are subject to concerns regarding the extent to which measured changes reflect “real” change versus measurement error (e.g., regression to the mean or other unreliability effects), a series of logistic regression models were also examined in which individuals with change scores indicating “reliable decline” (i.e., those in approximately the bottom third of the change score distribution) were compared with everyone else to evaluate the extent to which the same factors seen in the earlier linear regression models would be found to predict “decliners.” These analyses revealed a pattern of significant effects that largely parallels those from the linear regression models (data available on request from first author). For those reporting no chronic conditions, “decliners” were characterized by lower incomes and no regular physical activity. Among those with HBP, “decliners” were characterized by older age, poor lung function, higher
BMIs, as well as reporting no regular physical activity and more frequent social conflict; they were also more likely to have experienced an incident MI during follow-up. Among persons with diabetes, “decliners” were characterized by greater social conflict, as well as the absence of medication use. Among those with CVD, “decliners” were characterized by no reported regular physical activity and less frequent emotional support. Among those with a history of cancer, “decliners” were characterized by higher initial physical functioning and no reported regular physical activity. Among those with a history of fracture, “decliners” were characterized by higher systolic blood pressure and more frequent social conflict with others.

**DISCUSSION**

The analyses presented here examined the hypothesis that lifestyle behaviors, as well as sociodemographic and psychosocial factors, influence patterns of change in physical functioning over time in groups of older adults characterized by the presence of HBP, diabetes, CVD, cancer, and/or fractures. Findings from these analyses suggest two significant points.

First, for those reporting no conditions and for 3 of the 5 “disease” groups, engaging in regular physical exercise was seen to exert a protective effect: those who reported that they engaged in regular physical exercise were significantly less likely to experience declines over the 2.5-year follow-up. Only those with diabetes and fractures did not show this effect.

Second, social and psychological factors were unrelated to changes in functioning among those who report no chronic conditions at baseline. However, psychosocial factors did show significant, independent associations with change in functioning for individuals reporting the presence of HBP, diabetes, CVD, cancer, or fractures. Among those with prevalent CVD, greater emotional support was a significant, independent predictor of less decline. Among those with HBP and diabetes, greater reported social conflict was associated with significantly greater risks for decline. Among those with HBP and diabetes, greater reported social conflict was associated with significantly greater risks for decline. Among those with a history of cancer, instrumental self-efficacy beliefs were protective against declines, although this effect was seen only in the linear regression analyses (i.e., not in the logistic models predicting only more severe declines). Among those with a history of fracture, lower levels of psychological symptomatology were associated with less risk of decline, whereas greater social conflict with others was associated with increased risks for decline.

These variations across disease groups with respect to the specific psychosocial factors that were found to be associated with patterns of change were not predicted. Rather, our more general hypothesis had been that such psychosocial factors would influence patterns of change. Post hoc, it is possible to offer some suggestions as to the possible reasons for these observed variations. The fact that none of the psychosocial factors explained patterns of change in physical functioning among those with no chronic conditions at baseline is consistent with some earlier work from our group, suggesting that such psychosocial factors may impact on change in functioning more strongly among more vulnerable groups (e.g., those with poor health status and lower socioeconomic status; Unger, McAvay, Bruce, Berkman, & Seeman, 1999). Thus, it may be that, for individuals in relatively better health (i.e., those with no chronic conditions at baseline), psychosocial factors have less impact on changes in functioning. For this group, exercise was the only lifestyle factor seen to be a significant predictor of patterns of change in functioning. The fact that levels of emotional support were protective among those with prevalent coronary heart disease is also consistent with previous research, indicating that such support is also protective against mortality among those with coronary heart disease (Berkman, Leo-Summers, & Horwitz, 1992; King, Reis, Porter, & Norsen, 1993; Krumholz et al., 1998). Possible explanations for these links between emotional support and mortality or functional decline include hypothesized buffering effects of such support to reduce the stress of dealing with a chronic condition (Lyons, Sullivan, & Ritvo, 1995). Support for this proposed pathway can be seen in recent evidence, indicating that those reporting more emotional support exhibit lower levels of physiological arousal and that such lower arousal is linked to better outcomes, including lower mortality and better physical functioning (Seeman, Levy-Storms, Singer, & Ryff, in press; Seeman, Singer, Horwitz, & McEwen, 1997). The fact that social conflict was seen to be associated with declines in functioning among those with HBP and diabetes could reflect the relatively greater demands for those with such conditions to manage the disease through lifestyle (diet, exercise) modifications. If such lifestyle modifications serve as a lightening rod for social conflict with other family members (e.g., family demands that the individual comply or family criticism related to individual’s need for special foods, etc.), then individuals with these conditions may be at greater risk for exposure to social conflict. That such conflict is seen to predict poorer functional outcomes could reflect an association between such conflict and poorer disease management and/or associations between such conflict and greater general physiological arousal that has in turn been shown to predict poor functional outcomes (Seeman et al., in press; Seeman et al., 1997). For those with cancer or fractures, more psychological characteristics were seen to predict patterns of change. One might speculate that, in both cases, the relatively greater role of individual psychological characteristics (levels of instrumental efficacy for those with cancer and levels of psychological symptomatology for those with fractures) may reflect a greater tendency for these two types of conditions to have more direct impacts on functioning as a result of surgery and/or chemotherapy. In these cases, the individuals’ psychological outlooks may impact significantly on the degree to which they work to recover and/or maintain higher levels of functioning. Given the post hoc nature of the explanations offered for the observed pattern of psychosocial influences within the different disease groups, further research is obviously needed to evaluate their validity.

In considering these results, it is important to acknowledge some potential limitations of the data. First and foremost is the question of the generalizability of the findings presented here. As indicated at the outset, the MacArthur cohort was selected in 1988 (baseline) to represent the top third of those aged 70–79, with respect to physical and
cognitive functioning. Thus, our results may not generalize to the broader population of older adults. This is a question that will need to be addressed by further research. A related issue concerns the fact that the MacArthur Study database contains information only on the presence of chronic conditions (i.e., there is no information on the diagnosed severity of these conditions). Thus, it was not possible to examine the question of whether factors found to predict differences in functioning within groups were equally influential for those with more severe versus milder levels of disease. Strengths of the reported analyses, however, include the fact that the MacArthur cohort reflects considerable diversity with respect to gender, ethnicity, and socioeconomic status, and the rich array of potential health status, health behavior, and social/psychological factors that were assessed and were thus available for consideration as potential predictors of functioning.

The findings reported here highlight the fact that levels of functioning among older adults with chronic conditions are not solely determined by health status. This is noteworthy because, despite considerable and important research and clinical efforts to reduce risks for various chronic conditions, older age continues to be associated with increasing risks for most chronic conditions. Our findings highlight the fact that levels of physical functioning in older adults who experience such chronic conditions are not imminently tied to these health conditions. Rather, levels of functioning and, importantly, patterns of change in functioning over time were found to be influenced by potentially modifiable factors—physical exercise, social support, self-efficacy beliefs, and psychological symptomatology—indeed the presence of chronic conditions or other aspects of health status and of differences in sociodemographic characteristics. These findings suggest the potential utility, even among those with existing chronic conditions, of efforts to encourage regular physical activity in older adults as a means of promoting optimal levels of physical functioning. The data on the impact of social support and psychological profiles on patterns of change in functioning also suggest the potential utility of interventions in “at-risk” older adults with chronic conditions (i.e., those reporting low levels of social support, a low sense of self-efficacy, and/or high levels of psychological symptomatology).

Although older adults are certainly likely to continue to experience greater risks for various chronic conditions, the findings reported here suggest that the functional consequences of such conditions can be significantly and positively influenced by various lifestyle factors—factors that are themselves potential targets for interventions to promote more optimal levels of functioning. Such evidence will hopefully serve to dispel perceptions of chronic conditions as harbinger of inevitable decline. Rather, evidence that lifestyle and/or psychosocial factors impact on functional status can hopefully serve to encourage the view that there are steps that can be taken to protect against functional declines, even in the face of chronic conditions.

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References


Inouye, S., Albert, M., Moos, R. C., Sun, K., & Berkman, L. F. (1993). Cognitive performance in a high functioning community-dwelling...


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