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Correlates of Attributing New Disability to Old Age

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OBJECTIVES: To describe women who attribute new disability to old age and to identify demographic, medical, behavioral, and psychosocial characteristics that correlate with attributing new disability to old age.

DESIGN: Prospective cohort study with 4-year follow-up.

SETTING: Four geographic regions of the United States.

PARTICIPANTS: 9704 women aged ≥67 years participating in the Study of Osteoporotic Fractures. Of these, 657 who reported no disability at baseline but at follow-up reported difficulty carrying out 1 or more of 13 functional activities were eligible for our analysis.

MEASUREMENTS: All women reporting difficulty in any functional activity at follow-up were asked "What is the main condition that causes you to have difficulty or prevents you from (doing the activity)?" and were shown a card listing 14 medical conditions as well as the option "old age," from which they could choose only one response. Women attributing difficulty or inability in 1 or more functional activities to old age were classified as attributing new disability to old age. We examined the relationship between attributing new disability to old age and the following characteristics measured at baseline: age, level of education, medical comorbidity, cognitive function, body mass index (BMI), gait speed, grip strength, visual acuity, physical activity level, smoking status, social network level, and depressed mood.

RESULTS: Overall, 13.5% of women attributed new disability to old age. Age was a strong independent correlate of attributing new disability to old age: compared with women age 67 to 69, the odds of attributing new disability to old age for women age 70 to 79 was 3.6 times as large (95% confidence interval [CI] = 1.6–8.3), and for women age 80 or over was 5.5 times as large (95% CI = 2.1–14.7). The only other characteristic that remained an independent correlate of attributing new disability to old age was grip strength; for each decile decrease in grip strength, a woman's odds of attributing new disability to old age increased by 9% (odds ratio [OR] = 1.09, 95% CI = 1.01–1.19).

CONCLUSIONS: Despite great advances in geriatric medicine, old age is still perceived as a causal agent in functional decline, especially among our oldest patients. Further study is needed to determine whether, how often, and under what circumstances older adults who attribute new disability to old age have medical conditions amenable to interventions that could preserve their functioning and improve their quality of life. **J Am Geriatr Soc 49:134–141, 2001.**

Key words: aged; activities of daily living; disabled persons-psychology; cohort study; aging-psychology; normal aging; attribution

One of the central tenets of modern geriatric medicine is that it is inappropriate to attribute health problems among older adults to aging itself.[1] In his seminal article in 1981, Kart stated that "overattribution of symptoms to the aging process directs the attention of the elderly person away from real disease and/or environmental factors that may affect health . . . and may have tragic consequences."[2] Supporting this credo are empiric findings that older adults who attribute physical symptoms or disability to old age may have lower utilization of health services[3–5] and higher rates of mortality when followed longitudinally.[6] Evidence from both the Cardiovascular

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Health Study[7] and The Johns Hopkins Functional Status Laboratory[8] has demonstrated that a significant number of people who attribute disability to old age also have specific identifiable and potentially treatable medical conditions such as heart disease or arthritis. The concerning question this raises is whether older adults who attribute disability to old age are missing out on interventions that could improve their quality of life, slow disease progression, or prolong their active life expectancy.

Previous studies examining characteristics of older adults who attribute disability to old age have been limited to cross-sectional analyses.[7,8] While these have provided excellent descriptive information regarding older adults who attribute disability to old age, they do not differentiate between older adults who attribute chronic or life-long disability to old age from those who attribute new disability to old age. This distinction is important because attribution of a chronic disability to old age may serve as a successful coping mechanism when the impairment is irreversible. Alternatively, while new disability could also be irreversible, it may represent a new modifiable medical condition such as arthritis, deconditioning, or depression; attribution of disability to old age in this more acute setting is particularly important to understand.

Using data from the Study of Osteoporotic Fractures, a prospective study of women from four geographic sites in the United States, we therefore set out in this study to describe women who attribute new disability to old age and to identify longitudinal demographic, medical, behavioral, and psychosocial characteristics that correlate with attributing new disability to old age.

METHODS

Subjects

From September 1986 through October 1988, the Study of Osteoporotic Fractures recruited 9704 women who were at least 65 years of age in four areas of the United States: Baltimore, Maryland; Minneapolis, Minnesota; the Monongahela Valley, Pennsylvania; and Portland, Oregon. Age-eligible women were identified from population and membership-based lists from several sources.[9] The Study of Osteoporotic Fractures excluded African-American women because of their lower incidence of hip fractures,[10] all women who were unable to walk without assistance from another person, and women with bilateral hip replacements. At baseline (1986–1988) and at intervals of approximately 2 years duration, participants underwent extensive evaluation including interviews to assess functional status. We used visit two (1988–1990) as the baseline for our analysis because many of the independent variables and several of the functional status items in which we were interested examining were not measured at visit one. Because we were interested in examining baseline characteristics associated with attribution of incident disability occurring over a 4-year period, we used data from visit four (1992–1994) as our outcome measure. Of the original cohort of 9704 women, 8926 women were alive and completed a functional status interview at visit two. Of these, 4417 (49%) reported having "no difficulty" carrying out 13 activities of daily living from the 1984 National Health Interview Survey Supplement on Aging[11] and a modified Health Assessment Questionnaire (sample described in Table 1).[12] The 13 activities (shown in Table 2) include many but not all basic and instrumental activities of daily living. Women who reported having "some difficulty," "much difficulty," or being "unable to perform" an activity were categorized together as having disability. Women who stated that they "did not do (the activity) for reasons that were not related to health or a physical problem" were classified as not having disability. Of the 4417 functionally independent women, 3989 were alive and completed a follow-up functional status survey 4 years later at visit four: 786 (20%) reported new (since visit two) disability in one of the 13 functional activities, and thus were eligible for our analysis. We excluded 129 women who were missing key independent variables measured at baseline or at visit two (16% of those eligible), leaving 657 women with new disability in our cohort. The Human Subjects Review Committee at each of the 4 sites approved the protocol, and all participants gave written informed consent.

Independent Variables

Based upon review of the social science and medical literature,[7–8,13–20] as well as our own clinical experience caring for older adults (CS and CM), we hypothesized that an older person's future likelihood of attributing new disability to old age would correlate with baseline demographic, medical, behavioral, and psychosocial characteristics, as illustrated in our conceptual model (Figure 1). Most of the baseline variables in our model were available in the Study of Osteoporotic Fractures.

Age was coded in years. Level of education, a proxy for socioeconomic status, was categorized into 3 groups: $<$12 years, 12 years, $>$12 years. At the time of initial data collection (1986) no published validated comorbidity scale existed; a comorbidity score was derived for each woman from the sum of 8 self-reported medical conditions, 3 of which were asked about at visit one (diabetes, arthritis, Parkinson's disease), and 5 of which were asked about at visit two (chronic obstructive pulmonary disease [COPD], congestive heart failure, angina, heart attack, stroke). A modified version of the Folstein Mini-Mental State examination (MMSE) was administered at visit two (possible 26 points), with lower scores indicating more cognitive impairment.[21,22] Body mass index (BMI) was calculated as weight (kg)/height (m) squared. Weight was measured while wearing indoor clothing with shoes removed using a balance beam scale. Height was measured with a wall-mounted Harpenden stadiometer (Holtain Ltd., Dyved, UK).[23] Functional status was measured using two performance-based measures—gait speed and grip strength. Gait speed was determined by measuring the time in seconds needed to walk 6 meters at a rapid pace. Maximum grip strength was measured by means of a grip dynamometer (Preston Grip dynamometer, Takei Kiki Kogyo, Tokyo, Japan) in both hands and averaged. Interrater reliability was assessed in 15 subjects at each clinic who were tested 10 to 15 minutes apart by two different examiners and averaged for all clinics (r = 0.93). Binocular visual acuity with the participants' usual corrective lenses was measured at visit one using a Bailey-Lovie Letter Chart.[24]

Physical activity level was examined at visit one with a modified Paffenbarger survey, which has been validated in

Table 1. Baseline Characteristics of Women Reporting New Disability (The Study Sample) Compared With Women Reporting no Functional Difficulty at Follow-Up

Characteristic	New Functional Difficulty (N = 657)	No Functional Difficulty (N = 2749*)	*P*-Value*
Mean age, y ± SD	73.6 ± 5.2	72.1 ± 4.3	.0001
Education:			.7†
<12 years, n (%)	121 (18.4)	482 (17.5)	
12 years, n (%)	273 (41.6)	1119 (40.7)	
>12 years, n (%)	263 (40.0)	1148 (41.8)	
Reporting 2 or more medical comorbidities, n (%)	102 (15.5)	235 (8.6)	.001
Coronary artery disease, n (%)	56 (8.5)	175 (6.4)	.05
Previous stroke, n (%)	17 (2.6)	46 (1.7)	.12
Arthritis, n (%)	406 (61.8)	1286 (46.8)	.001
Chronic obstructive pulmonary disease, n (%)	56 (8.5)	133 (4.8)	.001
Diabetes, n (%)	38 (5.8)	98 (3.6)	.009
Parkinson's disease, n (%)	1 (.03)	5 (.18)	.871
Cognitively impaired,‡ n (%)	99 (15.1)	374 (13.6)	.33
BMI < 19, n (%)	29 (4.4)	82 (3.0)	.06
BMI ≥ 29, n (%)	165 (25.1)	439 (16.0)	.001
Rapid gait speed, m/sec ± SD	1.3 ± .2	1.4 ± .2	.0001
Grip strength, kg ± SD	19 ± 4.4	20.0 ± 4.4	.0001
Visual acuity worse than 20/40, n (%)	52 (7.9)	130 (4.7)	.001
Smoking status			.7†
Never, n (%)	417 (63.5)	1734 (63.1)	
Past, n (%)	178 (27.1)	779 (28.3)	
Current, n (%)	62 (9.4)	236 (8.6)	
Mean social network score, y ± SD§	3.1 ±.7	3.3 ±.7	.0001
Depression (6 or greater on 15-item GDS), n (%)	21 (3.2)	48 (1.8)	.02

Note: BMI = body mass index; GDS = Geriatric Depression Scale.

*The statistical significance of between-group differences was measured with chi-square or Fischer's exact tests for categorical variables and two-sided *t*-tests for continuous variables. Of the 3203 women still reporting no disability, 454 were missing key independent variables and so were not included in Table 1.

†chi-square test.

‡Scoring 23 or less on 26-item modified Folstein Mini-Mental State Exam (MMSE).

§Modified Lubben social network scale (19); higher scores indicate better social network.

postmenopausal women.[25–27] Smoking status was classified as never, former, or current. A social network score was computed using the 10 items from the Lubben Social Network Scale,[28] a refinement of the Berkman-Syme Social Network Index,[29] which has been validated in older adults. Depressed mood was assessed using the 15-item Geriatric Depression Scale (GDS).[30–32] With the exception of visual acuity, physical activity level, and some comorbidities (diabetes, arthritis, Parkinson's disease), which were measured at visit one, all baseline characteristics were measured at visit two. Though we realize that many women acquired new comorbidities over the 4-year study period, we chose to examine only comorbidity that preceded the disability because we wanted to strengthen our ability to infer causality.

Attribution of New Disability to "Old Age"

All women reporting disability in any functional activity at follow-up were asked "What is the main condition that causes you to have difficulty or prevents you from (doing the activity)?" Before responding, each participant was shown a card listing 15 conditions from which they were asked to choose only one: heart disease, stroke, lung disease, osteoporosis, diabetes, high blood pressure, arthritis, cancer, problems from a fracture injury, other injury, old age, dementia, mental illness, eye disease, and kidney dis-

Table 2. Frequencies of Reporting New Difficulty in Functional Activities and Attributing New Difficulty to Old Age (N = 657)

Functional Activity:	Number Reporting New Difficulty*	Number Attributing Difficulty to Old Age (% of those reporting new difficulty)
Doing heavy housework	317	33 (10.4)
Doing other chores	208	21 (10.1)
Walking 2–3 blocks	203	15 (7.4)
Washing oneself	168	4 (2.4)
Getting in and out of car	168	21 (12.5)
Climbing 10 steps	160	14 (8.8)
Shopping	112	9 (8.0)
Bending down to pick up clothes	107	6 (5.6)
Dressing oneself	89	4 (4.5)
Preparing meals	47	3 (6.4)
Getting in and out of bed	43	4 (9.3)
Turning on faucets	43	0 (0)
Lifting a cup to one's mouth	29	3 (10.3)
Any one activity	657	89 (13.6)

*Total >657 because many women reported new difficulty in more than one activity.

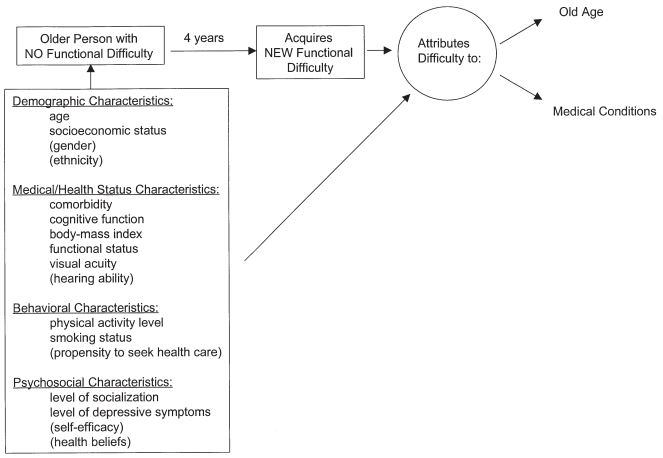

Figure 1. Conceptual model. Characteristics in parentheses were not available as baseline measures in our dataset.

ease. When women reported a condition not listed among the possible choices, their response was coded as "other." Because we felt that, from a clinical standpoint, attribution of any disability to old age could have important ramifications for the care received, we classified all women who attributed their disability in any one or more activity to "old age" as attributing new disability to old age.

ANALYSIS

For each of the 13 functional activities, the total number of women reporting new disability and the proportion of those who attributed their disability to old age were calculated. We then counted the frequency of each reported cause of new disability. We assumed responses coded as "other" represent a heterogeneous combination of specific medical conditions not included among the presented choices, as well as nonspecific multisystem age-associated changes not generally regarded as medical conditions. Because the specific responses coded as "other" were not recorded, we were unable to directly determine how often women who attributed their disability to "other" were thinking of other specific medical conditions. Therefore, to determine how women attributing disability to "other" should be categorized in subsequent analyses, we performed a series of bivariate analyses comparing the baseline characteristics of women who attributed disability to "other" with baseline characteristics of women who attributed their disability to specific medical conditions and women who attributed their disability to old age. Because these analyses (not shown, available by request) revealed that women who attributed disability to "other" showed no statistically significant differences from women who attributed disability to specific medical conditions ($P > .10$ for all comparisons), we categorized women who attributed disability to "other" with those who attributed disability to specific medical conditions for all subsequent analyses.

We then examined the bivariate relationships between attributing new disability to old age and each of the independent variables, using chi-square tests for categorical variables and two-sided Students' t-tests for continuous variables. Unadjusted odds ratios for each of the statistically significant ($P \leq .05$) bivariate characteristics were calculated; to facilitate interpretation of our findings, continuous variables were categorized either to decades (in the case of age) or deciles of response frequency within our sample (for all other variables).

To determine whether any characteristics independently correlated with attributing new disability to old age, we constructed a logistic regression model using all available demographic, medical, behavioral, and psychosocial characteristics from our conceptual model as independent variables, and attribution of new disability to old age as the dependent variable. The model was also adjusted for site of enrollment. Goodness of fit was examined by comparing the fitted probabilities of attributing new functional disability to old age with the observed frequencies within deciles of probability and calculating the corresponding chi-square statistics as described by Hosmer and Lemeshow.[33] Because women who reported disability in a greater number of activities would have had more opportunities to attribute disability to old age, we performed a sensitivity analysis to determine whether adjusting for the number of activities in which disability was reported would change our findings. To examine whether women simultaneously attributed multiple disabilities to old age, we counted the number of disabilities attributed to old age for those women who reported disability in more than one activity.

To examine the impact of our decision to categorize women who attributed any one activity to old age as old age attributers, we performed a sensitivity analysis in which we reconstructed our model using the sample of women who reported disability in two or more activities to predict attribution of two or more disabilities to old age. Comparison of the results of this model with those of our original model examining correlates of attributing one disability to old age showed our findings to be the same (results available by request). To examine whether our decision to group women who attributed disability to "other" with those who attributed disability to specific medical conditions may have influenced our findings, we performed a sensitivity analysis in which we reconstructed our original multivariate model examining correlates of attributing new disability to old age, excluding from our analysis the 129 women who attributed disability to "other." This exclusion had no effect on the results of the model (results available by request). All statistical analyses were carried out using SAS 6.12.[34]

RESULTS

Baseline characteristics of the 657 women in our sample are shown in Table 1. Also shown is a comparison between the women in our sample and those excluded because they did not report onset of new disability at the 4-year follow-up. The women who experienced new disability were older, reported a greater number of comorbidities, were more likely to be obese, had poorer vision, slower gait, weaker grip, poorer social networks, and were more likely to be depressed than women who did not report new functional difficulty at visit four ($P < .05$ for all comparisons). There were no statistically significant differences between the women excluded for missing key independent variables (n = 129) and those who remained in

the analysis (n = 657) with regard to age, level of education, BMI, number of comorbidities, number of activities for which new disability was reported, or percentage who attributed disability to "old age" ($P > .06$ for all comparisons, data not shown).

Forty-eight percent of women in our sample reported new disability in only one of the 13 activities, 22% reported disability in 2; 10 % reported disability in 3; 7% reported disability in 4, and 14% reported disability in 5 or more. Frequencies of reporting disability for each of the 13 functional activities are shown in Table 2, along with the corresponding frequencies of attributing the disability to old age among those reporting disability in that activity. Women most frequently experienced new disability doing heavy housework, doing other chores, and walking two to three blocks. Overall, 89 (13.6%) of the women reporting new disability at follow-up attributed new disability to old age. The frequency with which women attributed a single new disability to old age ranged from 0% for turning on faucets to 12.5% for getting in and out of a car. In addition to getting in and out of a car, other activities in which disability was frequently attributed to old age included doing heavy housework (10.4%), doing other chores (10.1%), and lifting a cup to one's mouth (10.3%). Difficulty washing oneself was infrequently attributed to old age, with only 2.4% of those with disability attributing the disability to old age.

Table 3 shows the frequency with which each condition was reported as the cause of new disability. Although 657 women reported new disability, many reported disability in more than one activity, so that there were 1573 new disabilities reported. Arthritis was the most frequently reported cause of disability (36.7% of reported disabilities), followed by "other" (13.7%), old age (8.7 %), stroke (8.1%), problems from a fracture injury (7.7%), and lung disease (6.0%). Diabetes, high blood pressure, mental illness, and eye disease were rarely reported as the cause of disability.

Bivariate correlates of attributing new functional disability to old age are shown in Table 4. Compared with women who did not attribute new disability to old age, women who attributed their new disability to old age were older (mean 76.8 years vs 73.1, $P = .0001$), had weaker grip (mean 17.5 kg vs 19.2, $P = .001$), were more likely to have visual acuity worse than 20/40 (14.6% vs 6.9%, $P = .01$), and scored lower on the measure of social network (mean 3.0 points vs 3.2, $P = .03$). In addition, although conventional levels of statistical significance were not reached, women attributing their new disability to old age appeared to be leaner (BMI 25.7 vs 26.5, $P = .11$) and have slower gait (1.27 m/sec vs 1.31, $P = .11$) than women who did not attribute new disability to old age. Age-specific rates of attribution to old age are shown in Figure 2; 4% of women aged less than 70, 14% of women aged between 70 and 80, and 27% of women aged 80 and older attributed new disability to old age.

Table 5 shows the unadjusted and adjusted odds ratios of each of the statistically significant ($P \leq .05$) correlates of attribution of new functional disability to old age. Age is the strongest correlate: after controlling for all other characteristics including comorbidity, women age 70 to 79 still had odds of attributing new functional disability to old age 3.6 times as large as women age 67 to 69 (95% CI = 1.6–8.3), and women age 80 or over had odds 5.5 times as large (95% CI = 2.1–14.7). The only other characteristic that remained an independent correlate of attributing new functional disability to old age was grip strength; for each decile decrease in grip strength in our sample, a woman's odds of attributing new functional disability to old age increased by 9% (OR = 1.09, 95% CI = 1.01–1.19). Although they were significant bivariate correlates, visual acuity, smoking history, and social network score did not independently correlate with attribution of new functional disability to old age in the multivariate model. The model chi-square goodness-of-fit statistic was 0.9, indicating excellent fit. Adjusting for the number of activi-

Table 3. Reported Causes of New Disability, Listed in Order of Frequency

Condition Reported as Cause of Disability	Frequency Reported as Cause of Disability*	Percentage of Disabilities Attributed to this Condition*
Arthritis	577	36.7
Other	215	13.7
Old age	137	8.7
Stroke	128	8.1
Problem from fracture injury	121	7.7
Lung disease	95	6.0
Other injury	78	5.0
Heart disease	71	4.5
Dementia	59	3.8
Cancer	37	2.4
Osteoporosis	18	1.1
Eye disease	14	0.9
Diabetes	10	0.6
Kidney disease	5	0.3
High blood pressure	3	0.2
Mental illness	3	0.2

*657 women reported new disability; most reported disability in more than one activity, resulting in a total 1573 new disabilities reported. Two responses were missing and are not included.

Table 4. Bivariable Correlates of Attributing Functional Difficulty to Old Age*

Characteristic	Attributing Difficulty to Old Age (N = 89)	Attributing Difficulty only to Medical Conditions (N = 568)	*P*-Value*
Mean age, y ± SD	76.8 ± 5.6	73.1 ± 5.0	.0001
BMI, y ± SD	25.7 ± 4.3	26.5 ± 4.8	.11
Rapid gait speed, m/sec ± SD	1.27 ± 0.2	1.31 ± 0.2	.11
Grip strength decrease, kg ± SD	17.5 ± 4.4	19.2 ± 4.3	.001
Visual acuity worse than 20/40, n (%)	13 (14.6)	39 (6.9)	.01
Smoking status:			.03†
Never, n (%)	65 (73.0)	352 (62.0)	
Past, n (%)	20 (22.5)	158 (27.8)	
Current, n (%)	4 (4.5)	58 (10.2)	
Mean social network score, y ± SD‡	3.0 ± 0.7	3.2 ± 0.7	.03

*The statistical significance of between-group differences was measured with chi-square tests for categorical variables and two-sided *t*-tests for continuous variables. Only those characteristics whose relationship with attribution of functional difficulty to old age was significant at a level $P < .15$ are shown here. Other characteristics examined include: level of education, number of comorbidities, cognitive function, physical activity level, smoking status, score on 15-item Geriatric Depression Scale (GDS).
†Mantel-Haenszel chi-square test.
‡Modified Lubben social network scale (19), higher scores indicate better social network.

ties in which disability was reported had essentially no effect upon our model (data not shown). Of the 342 women who reported 2 or more disabilities, 28 (8%) attributed 2 or more disabilities to old age. Seventeen women attributed 2 activities to old age, 6 attributed 3 activities to old age, 3 attributed 4 activities to old age, 1 attributed 4 activities to old age, 1 attributed 5 activities to old age, and 1 attributed 7 activities to old age. Fourteen of these women attributed all of their reported disabilities to old age (11 with 2 activities and 3 with 3 activities).

DISCUSSION

We have found that among a large geographically diverse group of community-residing older women, older age itself was a strong correlate of one's likelihood of attributing new disability to old age, even after controlling for demographic, medical, behavioral, and psychosocial characteristics. This is the first study to examine longitudinal correlates of attributing new disability to old age, and extends the work of previous investigators who have identified cross-sectional correlates of attributing disability to old age among a much smaller sample.[8]

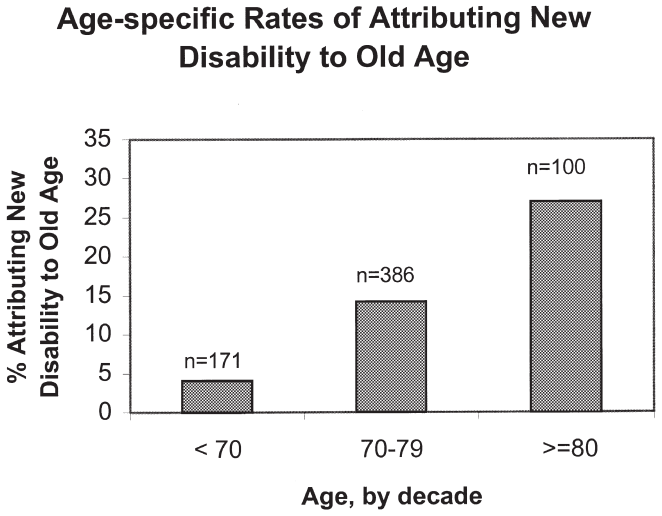

Figure 2. Age-specific rates of attributing new disability to old age.

On one level, our findings appear to reflect common sense: people who "have old age" are more likely to attribute disability to old age. Yet, this seemingly straightforward finding suggests that many older people still have not been hearing (or do not agree with), the messages that the geriatric and gerontological community have been advocating for years, namely that *old age itself is not a disease* and as such should not cause health problems such as disability. While it is reassuring that the great majority of women did not attribute new disability to old age, our finding that 27% of women aged greater than 80 who experienced disability attributed the disability to old age speaks to the fact that this is a phenomenon that we who work with older adults are likely to come into contact with nearly every day. Keeping this in mind, providers should carefully identify and evaluate new disability in the very old because among this group in particular it may be less likely to be reported.

Classical attribution theory postulates that people make attributions as part of a process of searching for meaning; for example, a person experiencing disability for the first time attempts to make sense of this by attributing causality.[13] When such an attribution is made by an older person who has a modifiable condition causing the problem—for example, a person experiencing difficulty walking up stairs due to occult coronary artery disease—attributing the disability to old age is clearly harmful. Alternatively, a physically fit 90-year old woman who does not like to take medications who experiences mild discomfort in her knees when she walks up stairs may prefer to attribute her disability to old age rather than perceive herself as having a medical illness, namely degenerative joint disease. Given that people who attribute symptoms to old age are known to experience reduced emotional distress compared with those who attribute symptoms to illness,[17] and that numerous studies have shown that older adults with chronic disabilities describe their quality of life to be far greater than others presume it would be,[35,36] our findings suggest that many old people may attribute new disability to old age as

Table 5. Significant Bivariate and Multivariate Correlates of Attributing New Functional Difficulty to Old Age

Characteristic	Unadjusted Odds Ratio (.95 confidence intervals)	Adjusted Odds Ratio* (.95 confidence intervals)
Age 67–69 (reference)	1.0	1.0
Age 70–79	3.9 (1.7–8.7)	3.6 (1.6–8.3)
Age 80 or greater	8.7 (3.6–20.8)	5.5 (2.1–14.7)
Grip strength, by decile of decline	.88 (.81–.95)	.92 (.84–1.0)
Visual acuity, by decile of decline	.89 (.83–.96)	.97 (.89–1.1)
No history of smoking	1.7 (1.0–2.7)	1.4 (.81–2.4)
Social network, by decile	.92 (.85–1.0)	1.0 (.93–1.1)

*Model adjusted for age, level of education, number of comorbidities, cognitive function, BMI, gait speed, grip strength, visual acuity, physical activity level, social network score, Geriatric Depression Scale (GDS) score, and enrollment site.

a coping mechanism in the face of what they perceive to be immodifiable functional impairment. How often and under what circumstances the impairments attributed to old age are indeed immodifiable is the crucial health policy question emerging from this research; while intervening when possible to prevent further functional decline should be an important goal of those caring for older adults, we agree with others who have argued that we must be careful in our zeal to preserve function that we do not medicalize the aging process itself.[37]

Several limitations should be considered when interpreting the findings of this study. First, because the Study of Osteoporotic Fractures involved almost completely a cohort of community-residing white women, the results may not be generalizable to groups of older persons with different demographic characteristics. Furthermore, our analysis is by design limited to women who did not report difficulty in higher functions two years after enrollment in a large study. We know from Established Populations for Epidemiologic Studies of the Elderly that approximately 36% of older women experience new disability in activities of daily living over a 4-year period; [38] clearly this sample represents a relatively healthy subset of older white women. In addition, because some women were nonrandomly excluded from our sample due to missing data, our effect size parameters may under- or overestimate the true relationship between the independent variables and attribution of new disability to old age. However, because the proportion of the eligible sample excluded for missing data was small (16%), it is unlikely that this would have affected our findings substantially.

It is also important to recognize limitations related to the closed-ended format of the attribution items. First, this format was not tested for reliability. Second, some medical conditions that cause disability were not included. Third, because participants were not permitted to choose more than one cause of their functional difficulty, our dichotomous outcome measure of attribution of new disability to "old age" does not reflect the fact that disability often results from multiple causes and is interpreted as such by older adults.[39] For example, many disabling geriatric conditions such as dizziness, deconditioning, and pain are multifactorial in nature and would be difficult to attribute in the provided disease-oriented format. Given this format, is not surprising that, like other investigators,[7] we found that many women attributed their disability to "other." Our finding that women who attributed disability to "other" were similar in terms of baseline characteristics to women who attributed disability to medical conditions provides a strong rationale for choosing to categorize these two groups together in our analyses. Nevertheless, it is important to keep in mind that the "other" category likely represents a combination of other medical conditions as well as multifactorial geriatric conditions.

Although the sensitivity analysis we conducted examining correlates of attributing two or more disabilities to old age did not identify any correlates other than old age, because few women (<50) attributed two or more activities to old age, it is still possible that our decision to categorize women who reported any one disability to old age as old age attributers might have diluted the effect of our outcome and limited our ability to identify more correlates of attributing disability to old age. Likewise, although we define "new disability" as difficulty or inability that was not reported 4 years previously, it is important to acknowledge that some of these older adults may have experienced transient disability at an earlier date[40]; the extent to which a history of disability would influence one's likelihood of attributing recurrent disability to "old age" is unknown and should be examined in future studies. It is also important to acknowledge that we examined many variables and used a *P*-value of .05 to define statistical significance, running the risk of false-positive findings due to multiple testing; the marginal grip strength finding should be re-examined in future studies prior to drawing conclusions from this finding. In addition, there were some variables, such as self-efficacy, which we hypothesized would correlate with attribution of new disability to old age, that were omitted from our analysis because they were not measured in this dataset. Other studies should be done to examine the role of these potential correlates of attribution of new disability to old age.

In conclusion, this study illustrates that many older women attribute new disability to old age and that age itself is a strong correlate of increased likelihood of attributing new disability to old age. Physicians and others caring for older adults need to be aware that despite years of advocacy on the part of the geriatrics community, old age is still perceived as a causal agent in functional decline, especially among our oldest patients. Given the pervasiveness of this phenomenon among our oldest patients, further study is needed to determine whether, how often, and un-

der what circumstances older adults who attribute new disability to old age are missing out on potentially beneficial interventions that could improve their quality of life.

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REFERENCES

1. Rowe JW, Kahn RL. Human aging: Usual and successful. Science 1987;237: 143–149.
2. Kart C. Experiencing symptoms: Attribution and misattribution of illness among the aged. In: Hug M, ed. Elderly Patients and their Doctors. New York: Springer, 1981, pp 70–78.
3. Leventhal EA, Prohaska TR. Age, symptom interpretation, and health behavior. J Am Geriatr Soc 1986;34:185–191.
4. Gjorup T, Hendriksen C, Lund E et al. Is growing old a disease? A study of the attitudes of elderly people to physical symptoms. J Chron Dis 1987;40: 1095–1098.
5. Goodwin JA, Black SA, Satish S. Aging versus disease: The opinions of older Black, Hispanic, and non-Hispanic White Americans about the causes and treatment of common medical conditions. J Am Geriatr Soc 1999;47:973–979.
6. Rakowski W, Hickey T. Mortality and the attribution of health problems to aging among older adults. Am J Public Health 1992;82:1139–1141.
7. Ettinger WH, Fried LP, Harris T et al. Self-reported causes of disability in older people: The Cardiovascular Health Study. J Am Geriatr Soc 1994;42: 1035–1044.
8. Williamson JD, Fried LP. Characterization of older adults who attribute functional decrements to "old age." J Am Geriatr Soc 1996;44:1429–1434.
9. Cummings SR, Black DM, Nevitt MC et al. Appendicular bone density and age predict hip fracture in women. JAMA 1990;263:665–668.
10. Farmer ME, White LR, Brody JA et al. Race and sex differences in hip fracture incidence. Am J Public Health 1984;74:1374–1380.
11. Fitti JE, Kovar MG. The supplement on aging to the 1984 national health interview survey. Vital & Health Statistics-series 1: Programs & collection procedures. 1987;21:1–115.
12. Pincus T, Summey JA, Soraci SA et al. Assessment of patient satisfaction in activities of daily living using a modified Stanford Health Assessment Questionnaire. Arthritis and Rheumatism 1983;26:1346–1353.
13. Shaver KG. An Introduction to Attribution Processes. Cambridge, MA: Winthrop Publishers, 1975.
14. Stoeckle JD, Barsky AJ. Attributions: Uses of social science knowledge in the "doctoring" of primary care. In: Eisenberg L, Kleinman A, eds. The Relevance of Social Science for Medicine. Boston: D. Reidel Publishing Company, 1980, pp 223–240.
15. Lau RR, Hartman KA. Common sense representations of common illnesses. Health Psychol 1983;2:167–185.
16. Prohaska TR, Leventhal EA, Leventhal H et al. Health practices and illness cognition in young, middle aged, and elderly adults. J Gerontol 1985;40:569–578.
17. Prohaska TR, Keller ML, Leventhal EA et al. Impact of symptoms and aging attribution on emotions and coping. Health Psychol 1987;6:495–514.
18. Robbins JM, Kirmayer LJ. Attributions of common somatic symptoms. Psychol Med 1991;21:1029–1045.
19. Kessler D, Lloyd K, Lewis G et al. Cross sectional study of symptom attribution and recognition of depression and anxiety in primary care. BMJ 1999; 318:436–440.
20. Leventhal H, Nerenz DR, Steele DJ. Illness representations and coping with health threats. In: Baum A, Singer J, eds. A Handbook of Psychology and Health. Hillsdale, NJ: Lawrence Erlbaum Associates, Inc., 1984, pp 219–252.
21. Folstein MR, Folstein SE, McHugh PR. Mini-mental state: A practical method for grading the cognitive state of patients for the clinician. J Psychiatr Res 1975;12:189–198.
22. Teng EL, Chui HC. The Modified Mini-Mental State (3MS) examination. J Clin Psychiatry 1987;48:314–318.
23. Lohman TG, Martorell R. Anthropomorphic Standardization Reference Manual. Champaign, IL: Human Kinetics Books, 1988, pp 39–54.
24. Bailey IL, Lovie JE. New design principles for visual acuity letter charts. Am J Optom Physiol Optics 1976;53:740–745.
25. Paffenbarger RS, Wing AL, Hyde RT. Physical activity as an index of heart attack risk in college alumni. Am J Epidemiol 1978;108(3):161–175.
26. Cauley JA, Petrini AM, LaPorte RE et al. The decline of grip strength in the menopause: Relationship to physical activity, estrogen use and anthropometric factors. J Chron Dis 1987;41:115–120.
27. La Porte RE, Montoye JH, Caspersen CJ. Assessment of physical activity in epidemiologic research: Problems and prospects. Public Health Rev 1985; 100(2):131–146.
28. Lubben JE. Assessing social networks among elderly populations. Fam Comm Health 1988;11(3):42–52.
29. Berkman LF, Syme SL. Social Network, host resistance, and mortality: A nine-year follow-up study of Alameda residents. Am J Epidemiol 1979;109:186–204.
30. Sheikh JI, Yesavage JA. Geriatric Depression Scale (GDS): Recent evidence and development of a shorter version. Clin Gerontol 1986;5:165–173.
31. D'Ath P, Katona P, Mullan E et al. Screening, detection and management of depression in elderly primary care attenders. I. The acceptability and performance of the 15 item geriatric depression scale (GDS15) and the development of short versions. Fam Pract 1994;11:260–266.
32. Gerety MB, Williams J, Jr., Mulrow CD et al. Performance of case-finding tools for depression in the nursing home: Influence of clinical and functional characteristics and selection of optimal threshold scores. J Am Geriatr Soc 1994;42:1103–1109.
33. Hosmer DW, Lemeshow S. Applied Logistic Regression. New York: John Wiley & Sons Inc., 1989.
34. SAS Institute, Inc. SAS Software System, Version 6.12. Cary, NC: SAS Institute, Inc., 1998.
35. Pearlman RA, Uhlmann RF. Quality of life in chronic diseases: Perceptions of elderly patients. J Gerontol 1988;43:M25–M30.
36. Mangione CM, Marcantonio ER, Goldman L et al. Influence of age on measurement of health status in patients undergoing elective surgery. J Am Geriatr Soc 1993;41:377–383.
37. Campion EW. Aging better (editorial). N Engl J Med 1998;338:1064–1066.
38. Guralnik JM, LaCroix, Abbott RD et al. Maintaining mobility in late life (part I): Demographic characteristics and chronic conditions. Am J Epidemiol 1993;137:845–857.
39. Verbrugge LM, Jette AM. The disablement process. Soc Sci Med 1994;38:1–14.
40. Gill TM, Robison JT, Tinetti ME. Predictors of recovery in activities of daily living among disabled older persons living in the community. J Gen Intern Med 1997;12:757–62.

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