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We investigated the relationship between baseline internal health locus of control (IHLC) and 6-year change in physical functioning in 356 older adults. IHLC was strongly related to change in physical functioning for women at all levels of baseline functioning, but only affected men with lower baseline functioning. Cross-sectional analyses indicated no relationship between IHLC and health seeking activities except changing eating patterns when sick. Other findings were that IHLC was related to depression and not having childhood illness for men and to number of negative life events for women. For both genders IHLC was related to the importance placed on good health.

Key Words: Self-efficacy, Depression, Gender differences

Impact of Internal Health Locus of Control on Health Outcomes for Older Men and Women: A Longitudinal Perspective[1]

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Increased life expectancy since the turn of the century has been accompanied not only by an increased number of older individuals but also by a change in the pattern of disease. Chronic rather than acute illness is now a primary concern for practitioners, who must assist clients in managing disease processes over extended periods of time, and for policy makers who wish to contain the high cost of health care (Lubkin, 1990; Minkler & Estes, 1991; Rivlin & Wiener, 1988). As a consequence, factors that may influence the incidence of chronic illness, the impact of chronic illness, and the maintenance of function in older adults have received increasing attention in gerontological research. Health locus of control is one such factor.

Health Locus of Control

The concept of health locus of control derives from social learning theory and the more general construct of locus of control (Rotter, 1966; Wallston, Wallston, Kaplan, & Maides, 1976). Locus of control relates to generalized expectations regarding who or what is responsible for outcomes. Those with an internal locus of control are defined by their belief that what happens to them, whether positive or negative, is the consequence of their own actions and thus potentially under their control. In contrast, those with an external locus of control believe such events to be related to something external to themselves and thus beyond their control (Lefcourt, 1976). Research related to the control construct is based on the assumption that those with an internal locus of control will take on more adaptive behaviors, be more actively involved in their own health care, and will experience greater psychological and physiological benefits than those with an external locus of control (Oberle, 1991; Wallston & Wallston, 1982; Wolk & Kurtz, 1975).

While locus of control theory suggests potentially positive actions by individuals with an internal belief system, the theory also implies that generalized expectancies give way to more specific expectancies as one gains more experience with a given situation. Researchers thus created situation-specific measures of control expectancies, such as those related to health (Wallston, Maides, & Wallston, 1976; Wallston, Wallston, & DeVellis, 1978). These more focused expectancies were proposed as providing better predictive power than generalized locus of control beliefs in explaining health related behaviors (Wallston et al., 1976). Subsequent research with the health locus of control scale has provided equivocal results (Wallston & Wallston, 1982; Wallston, 1989). For example, McLean and Pietroni (1990) found that an internal health locus of control orientation was related to the successful adoption of self-care practices during a program at a general health center in London. Wassem (1991) interviewed patients with multiple sclerosis and found that those with an internal health locus of control not only had a more benign course but also had greater knowledge of their disease and practiced more self-care behaviors than did those with an external health locus of con-

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trol orientation. De Weerdt, Visser, Kok, and van der Veen (1990) found that having a powerful other health locus of control negatively influenced self-care behaviors in diabetics. On the other hand, an internal health locus of control orientation was found to be negatively related to weight loss (Gierszewski, 1983), had no predictive value in distinguishing between those who complied with or dropped out of a cardiac rehabilitation program (Oldridge & Streiner, 1990), and had inconsistent relationships with functional health in older adults (Duffy & MacDonald, 1990). In a review of the literature on locus of control over 10 years, Oberle (1991) noted that the concept has not been shown to be a reliable predictor of health behavior in either young or elderly persons. However, Oberle also noted design flaws in most of the studies she reviewed. Typically the studies used samples that were too small, instruments that had not been validated, and study designs that were only cross-sectional.

Our study directly addresses the concerns raised by Oberle. The design utilizes a relatively large sample, includes measures that have been used throughout the Alameda County Study and validated by other researchers, and involves a prospective study with a 6-year follow-up. With such a design, the impact of baseline internal health locus of control on subsequent change in physical functioning and mortality can be analyzed. In addition, associations between baseline internal health locus of control beliefs and health behaviors can be analyzed as potential mechanisms for any relationships found between health beliefs and subsequent physical functioning.

Further, because the sample contained sufficient numbers of both men and women, we were also able to examine the potentially different impact of IHLC beliefs on outcomes for men vs women. This is a relatively unexplored area. There are data on differences in psychological states between men and women, such as depression and perceived health (Kaplan & Camacho, 1983; Lewinsohn, Rohde, Seeley, & Fischer, 1991; USDHHS, 1993), but there has been minimal research exploring the differential impact of such psychological states or health beliefs on subsequent physiological or psychosocial outcomes. Specifically, there has been little work exploring whether health locus of control beliefs have a differential impact on outcomes for men and women even though some data suggest that men and women differ in their beliefs regarding control (Cicirelli, 1980; Miller, 1987).

Methods

Sample

The sample was drawn from the Alameda County Study. Respondents were part of the original cohort of 6,928 persons selected to represent the adult non-institutionalized population of Alameda County in 1965. Surviving members were reinterviewed in 1974 and a representative 50% subsample of those interviewed in 1974 was interviewed for a third time in 1983. Detailed design and sampling procedures for these surveys have been reported elsewhere (Berkman & Breslow, 1983; Guralnik & Kaplan, 1989).

All cohort members who were 65 years old or older in 1984 and who had been interviewed in 1983 were designated for a 6-year longitudinal study of factors related to change in functioning. Interviews were obtained with 508 in 1984. At follow-up in 1990, 127 persons had died, 5 could not be located, and 20 declined to be interviewed. Interviews were completed with 356 — 147 men (41%) and 209 women (59%). There were 42 blacks among the surviving 356 (12%). Numbers for other ethnic groups were small. The 356 survivors are used in analyses examining change in physical functioning. Cross-sectional analyses utilize data from the full sample of 508.

"Baseline" refers to information collected in 1983 or 1984. Proxy respondents (nearly always spouses or adult children) numbered 35 in 1984 and 38 in 1990. Analyses of a range of factors associated with change in functioning for all respondents combined and for men compared with women are available elsewhere (Kaplan, Strawbridge, Camacho, & Cohen, 1993; Strawbridge, Camacho, Cohen, & Kaplan, 1993).

Demographic and Health Related Variables

Demographic variables include age, ethnicity, income (adjusted for family size), and years of school completed. The small number of Asians and Hispanics in the sample were combined with whites for black/non-black comparisons.

For health related behaviors, smoking was categorized as not current (previous or never) vs current smoker. Exercise was measured with a scale containing five items: exercises long enough to work up a sweat; takes part in any sports exercise; walks for exercise; does calisthenics or stretches; and does any other vigorous exercise. Scoring for each item is from 0 (no or never) to 4 (yes or often) with intermediate values based upon frequency. Responses to the five items were summed. "Going out" measured how many days in an average week respondents went out to do things they enjoyed doing, such as visiting friends or going to social events. Scoring is from 1 (never) to 6 (every day). Simple "yes/no" health behavior variables included whether subjects took vitamins regularly, meditated when sick, changed eating patterns when sick, got regular medical checkups, and had a regular doctor.

Social contacts were measured with the Social Network Index, which has been extensively described elsewhere (Berkman & Syme, 1979). The scale has a range of 1 to 12 with higher values indicating more frequent social contacts. Perceived health was measured by comparing those who answered "excellent" with those who answered "good," "fair," or "poor." Importance of good health was categorized as "very" vs all other responses. Depression was measured with an 18-item scale of depressive systems (Kaplan, Roberts, Camacho, & Coyne, 1987; Roberts & O'Keefe, 1981). Prevalent chronic conditions were measured by counting how many of the following conditions the respondent reported expe-

riencing within the past 12 months: arthritis, stroke, heart disease, chronic obstructive pulmonary disease, cancer, diabetes, high blood pressure, or asthma.

Prior Health and Negative Life Events

Serious childhood illness was measured as "yes" if respondents said they had experienced any of the following through age 15: polio, whooping cough, rheumatic fever, diphtheria, pneumonia, tuberculosis, hospitalization, operation, or any serious injury. Negative life events were measured by adding the number of times in the previous seven years subjects reported serious illnesses, injuries, or operations to self, spouse, child, or close relatives; death of spouse, parent, in-law, or close friend; job problems or loss; sexual problems; neighborhood deterioration; or change of residence. There were 14 items in all, but the highest score recorded was 11.

Internal Health Locus of Control

Internal health locus of control was based upon two questions from Form B of the Multidimensional Health Locus of Control scale (Wallston et al., 1978): "When I feel ill, I know it is because I have not been taking care of myself properly," and "I am directly responsible for my health." These two items were selected from the full 6-item Internal Health Locus of Control Scale after consulting with the scale's developer, Dr. Wallston, who chose them by examining which two items would most reduce the alpha reliability of the 6-item scale if removed (K. A. Wallston, personal communication, 1981). While alpha reliabilities on a two-item scale are considered misleading, alpha reliability of the full 6-item scale as reported by Wallston is .71 (Wallston et al., 1978). Respondents were asked how well each of the two statements described them. Responses ranged from 1 ("not at all") to 4 ("very well"). Answers were summed. The resulting scale ranged from 2 to 8, with higher scores indicating stronger internal health locus of control. Mean scores were 5.2 for men and 5.0 for women. This small gender difference was not statistically significant.

Dependent Variable: Function Scale

To measure change in function over time we used an 18-item self-report function scale. The specific items include seven Activities of Daily Living (ADL) (bathing, eating, dressing, using the toilet, walking, transferring from bed to chair, and grooming), three Instrumental Activities of Daily Living (IADL) (cooking, shopping, and housework), two mobility measures (walking 1/2 mile or climbing a flight of stairs), five Nagi physical performance items (push/pulling a large object, crouching/kneeling, lifting a 10-pound weight, lifting arms over the head, and picking up small objects), and one item asking how much of a problem it was getting to places where the person wanted to go (Katz, Downs, Cash, & Grotz, 1970; Lawton & Brody, 1969; Nagi, 1976; Rosow & Breaslau, 1966). Each item is scored from 0 (cannot do or need help to do) to 4 (can/could do without help).

Intermediate scores of 1–3 for the 12 ADL and physical performance measures were based upon level of difficulty in doing the activity (a lot, some, a little). Intermediate scores of 2 for the three IADL items were also based upon level of difficulty (able to do some but not all). The item on how much of a problem it was getting where one wanted to go was scored "2" if the response was "a little problem." The two mobility items had no intermediate values. All 18 items were summed; the resulting scale had a maximum possible value of 72 and a minimum of 0. Higher scores indicate better functioning. For 1990 the function scale had a mean of 62.3, with a standard deviation of 14.9 and a range of 0–72. Cronbach's alpha was .94.

Analysis

After summarizing the characteristics of the sample, we examined the regressions of IHLC on a number of demographic/historical, health related activities, and social/psychological variables obtained at baseline for both men and women. The full baseline sample of 508 persons is used for these analyses.

We then used linear regression analysis to examine the association of both baseline IHLC and the interaction of baseline IHLC and baseline function with subsequent change in physical functioning for those interviewed at follow-up in 1990. We also examined these relationships controlling for prevalent chronic conditions and health promoting behaviors. The health promoting behaviors used were those previously shown to be strongly related to subsequent change in physical functioning (Strawbridge et al., 1993). For men these behaviors included exercise, not currently smoking, and having more than the minimum score on the Social Network Index. For women the behaviors were going out, not currently smoking, and having more than the minimum score on the Social Network Index.

When analyzing factors associated with change in physical functioning, we used a method recommended by Lee (1980) to perform regressions with a change score: The 1990 function scale score was entered as the dependent variable, while the 1984 score was entered as an independent variable along with the factor and control variables being examined. This procedure yields the same result as using the difference between the 1990 and 1984 function scores as the dependent variable and entering the 1984 score as a control variable along with the other variables. Age in years is entered in all models as a control.

We also examined the relationship between baseline IHLC and subsequent mortality using the Cox proportional hazards model, which examines time from year of study entry to year of death (Cox, 1972).

Results

Sample Characteristics

Table 1 summarizes baseline sample characteristics for men and women interviewed in 1984 and

1990. The women are somewhat older and more likely to be divorced or separated than the men. They also have less income, less formal education, and poorer perceived health than their male counterparts. As compared to men, women had slightly more chronic conditions and were more mobility impaired or ADL dependent. Functioning scores are lower for women at both baseline and follow-up. Women also declined more than men during the 6-year follow-up. Both genders have similar mean scores on the IHLC scale (5.0 for the women, 5.2 for the men). The only unusual finding reported in this table is that smoking was more prevalent among the women at baseline than among the men.

Additional analyses revealed that a higher proportion of women than men declined in functioning during follow-up (60% vs 50%). However, a higher proportion of women also improved during follow-up (20% vs 13%). A higher proportion of men remained the same (37% vs 20%).

Cross-Sectional Associations

Regressions of IHLC on selected demographic and historical variables at baseline are shown in Table 2. Age had a weak positive association with IHLC for men but a weak negative one for women. Family income and having had a serious childhood illness were negatively associated with IHLC for men. For women, income and negative life events were positively associated with IHLC. No relationships were found for education, ethnicity, prior hospitalization, or chronic conditions.

Table 3 presents regressions of IHLC on health behaviors, health seeking activities, and social/psychological variables at baseline. For health behaviors only smoking was positively associated with IHLC for

Table 1. Baseline Characteristics for Surviving Men and Women (N = 356)

Variable	Scoring	Men (n = 147)	Women (n = 209)
	Demographic		
Age	Mean years of age	71.1	72.5
Ethnicity	percent black	9.7	13.4
Family income	percent in lowest quintile	13.6	21.2
Education	percent with 8 years or less	15.8	20.7
Marital status	percent separated or divorced	2.7	9.1
	Health		
Number of chronic conditions	Mean	1.2	1.5
Smoking	percent currently smoking	12.9	17.8
Perceived health	percent fair or poor	17.7	26.3
Mobility impaired	percent needing help walking 1/2 mile or climbing stairs	8.2	16.7
ADL dependent	percent having some difficulty on one or more ADLs	3.4	8.6
Baseline functioning	Mean 1984 function score	69.8	66.6
Follow-up functioning	Mean 1990 function score	64.9	60.5
Change in functioning	1990 score — 1984 score	−4.9	−6.1
IHLC	Mean score at baseline	5.2	5.0

Table 2. Regressions of IHLC on Demographic and Precursor Variables for Men and Women at Baseline Controlling for Age (N = 508)

Characteristic	How Measured	Regression Coefficients	
		Men	Women
Age	Years in 10 year units	.36*	−.25*
		(.20)	(.14)
Family income	Annual income in $10,000 units adjusted for family size	−.40***	.20*
		(.17)	(.12)
Education	More than 8 years/less	.23	−.05
		(.32)	(.03)
Ethnicity	Black/other	.32	−.36
		(.41)	(.29)
Childhood illness	Had serious illness/did not	−.47*	−.23
		(.25)	(.22)
Prior hospitalization	Yes/no	−.07	.23
		(.25)	(.15)
Chronic conditions	One or more/none	.07	.00
		(.12)	(.09)
Negative life events	Number from 0 to 14	−.09	.16**
		(.08)	(.06)

Note: Regression coefficients (unstandardized) represent mean change in the internal health locus of control scale associated with each one-point change in the indicated variable holding age constant. Standard errors are shown in parentheses.
*$p < .10$; **$p < .05$; ***$p < .01$.

Table 3. Regressions of IHLC on Health and Social/Psychological Factors for Men and Women at Baseline Controlling for Age (N = 508)

Characteristic	How Measured (Range)	Regression Coefficients	
		Men	Women
	Health Behaviors		
Current smoker	Yes/no	.06	.62**
		(.34)	(.27)
Exercise	5 item scale (0–20)	.00	−.01
		(.02)	(.02)
Going out	Days per week (1–6)	−.11	−.06
		(.09)	(.07)
Take vitamins	Yes/no	.01	−.05
		(.15)	(.13)
	Health Seeking Activities		
Meditate when sick	Yes/no	.63	.20
		(.39)	(.13)
Change eating patterns when sick	Yes/no	.81***	.23**
		(.27)	(.09)
Get regular checkups	Yes/no	−.02	−.05
		(.12)	(.09)
Have regular physician	Yes/no	.28	−.01
		(.19)	(.33)
	Social/Psychological		
Perceived health	Excellent/good, fair, poor	.04	−.09
		(.16)	(.14)
Depression	18 item scale (0–18)	.16***	−.01
		(.06)	(.04)
Social contacts	Social Networks Index (1–12)	−.04	.01
		(.04)	(.03)
Importance of good health	Very/other	.69***	.20*
		(.15)	(.11)

Note: Regression coefficients (unstandardized) represent mean change in the internal health locus of control scale associated with each one-point change in the indicated variable holding age constant. Standard errors are shown in parentheses.

*$p < .10$; **$p < .05$; ***$p < .01$.

women. No relationships were found for exercise, going out, or taking vitamins. For health seeking activities, changing eating patterns when sick was positively associated with IHLC for both men and women. The relationship between IHLC and meditating when sick was positive but not statistically significant (p = .12 for men and p = .11 for women). No relationships were found for getting regular checkups or having a regular physician.

The importance of good health was strongly associated with IHLC for men; there was a similar, but weaker, relationship for women. The other social/psychological variable showing a relationship was depression, which was positively associated with IHLC for men. No relationship with IHLC for either gender was found for social contacts or perceived health.

Given the strong relationship between IHLC and importance of good health, all of the regressions in Tables 2 and 3 were examined with adjustment for the importance of good health. When this adjustment was made, no meaningful differences in the regression coefficients or associated significance levels occurred.

Change in Subsequent Physical Functioning

The associations between baseline IHLC and change in physical functioning over the 6-year follow-up for both men and women are shown in Table 4. Baseline function score and age are included in all models as adjustment variables. The second model in the table adds baseline prevalent chronic conditions, while the third adds health promoting behaviors measured at baseline. For men, there is no association between IHLC and change in physical functioning in any of the three models, while for women there is a strong association in all three models. The regression coefficient of +1.41 in the first model for women can be interpreted as indicating a 1.41 point higher score on the 1990 function scale for each one point higher score on IHLC controlling for age and baseline function. This relationship is statistically significant ($p < .01$). The mean difference in the 1990 function scale score for a woman with an IHLC score of 8 (the highest) compared to one with a score of 2 (the lowest) would be 8.5 points, a relatively large difference. As Table 4 further indicates, the coefficients for IHLC remain essentially unchanged for women in the second and third models when prevalent chronic conditions and health promoting behaviors are included.

Interaction Between IHLC and Baseline Functioning

Introducing the interaction term (IHLC × baseline function) into the equations in Table 4 had no effect on the relations shown for women but did have an

Table 4. Associations Between IHLC and Change in Physical Functioning with Co-variates for Surviving Men and Women

Model	Parameter Estimate	*P* Value
Men (n = 147) Baseline Function Score, Age, and:		
1. IHLC	−0.26 (0.59)	.66
2. IHLC	−0.35 (0.60)	.56
Prevalent chronic conditions	−0.57 (1.17)	.63
3. IHLC	−0.30 (0.60)	.61
Prevalent chronic conditions	−0.18 (1.18)	.88
Health promoting behaviors[a]	+3.31 (1.50)	.03
Women (n = 209) Baseline Function Score, Age, and:		
1. IHLC	+1.41 (0.46)	<.01
2. IHLC	+1.37 (0.47)	<.01
Prevalent chronic conditions	+0.17 (0.75)	.82
3. IHLC	+1.42 (0.47)	<.01
Prevalent chronic conditions	+0.20 (0.75)	.79
Health promoting behaviors[b]	+2.58 (1.11)	.02

Note: Parameter estimates represent mean change in the 1990 function score for each one-point change in the indicated variable. Standard errors are shown in parentheses.

[a]Includes exercises enough to work up a sweat, not smoking, and above lowest score on the Social Network Index.

[b]Includes going out, not smoking, and above lowest score on the Social Network Index.

effect for men. Controlling for baseline functioning and age, the interaction coefficient for men is −.38 ($p < .01$). The interaction is stronger (interaction coefficient = −.55, $p < .01$) when prevalent chronic conditions are added in the second model and increases further when the health promoting behaviors are included (interaction coefficient = −.60, $p < .01$). These results indicate that for men the effect of IHLC on change in physical functioning depends on their level of functioning at baseline: The lower the level of baseline functioning, the greater is the impact of IHLC on 1990 functioning. For example, comparing two men with a baseline function score of 60, each one-point difference in baseline IHLC is associated with a 3.5 point difference in the 1990 function score. At a baseline score of 65, the effect of IHLC on 1990 functioning is reduced to 1.6 points for each one-point difference in the IHLC scale. At a baseline function score of 69 (approximately the mean score for the men), the effect of IHLC on follow-up functioning is zero. These examples are from the first model, which adjusted only for age and baseline functioning, but similar results are obtained from the other two models with further adjustments for chronic conditions and health promoting behaviors. Thus for men there appears to be a relationship between IHLC and follow-up functioning only for those having relatively low baseline function scores.

Mortality

Cox proportional hazards models were used to test the relationship between IHLC and subsequent mortality for all 508 persons interviewed in 1984. Age was included as a control variable. For men the relative mortality risk associated with each one-point increase in IHLC was 1.00 ($p = .91$). For women the relative mortality risk was 1.08 ($p = .20$). These results suggest that there is no relationship between IHLC and subsequent mortality for either men or women.

Discussion

The results of our study support a complex relationship between health locus of control orientation, change in physical function, and various health-related behaviors. The results also raise important questions for future research. Of special interest is the association between internal health locus of control at baseline and change in functional status of women at follow-up, independent of other factors. That is, internal health locus of control did not appear to be related to better functional outcomes through an association with health-promoting behaviors in women; rather, it appears to have had a strong direct effect. On the other hand, the relationship between internal health locus of control and functional status in men is more complex. Starting with no association with follow-up functioning for men with mean function scores at baseline, IHLC had an increasingly positive relationship with follow-up functioning as baseline function scores decreased. This interactive relationship implies that only men with relatively low functional status at baseline benefited from the effects of an internal health locus of control. This interactive effect was not found in women.

The different findings for men and women in this study are difficult to interpret. Data are lacking regarding the differences in control orientations between men and women, and those studies that are available rarely relate such differences to variations in outcomes. Some data suggest that men may have different control needs and a more internal orientation than women (Cicirelli, 1980; Miller, 1987). However, because socioeconomic status also has been found to be related to internality (Hunter, Linn, Harris, & Pratt, 1980; Lefcourt, 1976), the joint effects of gender and social class must be considered. In our study, women had lower education and family income than did the men, yet both genders had similar mean scores on the internal health locus of control scale.

Still, the findings that internal health locus of control had an independent and important effect on change in function in women and an interactive effect with baseline function and change in function in men are valuable and merit further study. One study of an all-male sample did suggest that locus of control orientation buffered psycho-physiological distress, with men who expressed moderate internality experiencing the least distress (Krause & Stryker, 1984). Other data, however, suggest that poorer health status would promote a more external control orientation (Hunter et al., 1980). It is possible that men who have poorer initial function and yet do not become more externally oriented achieve better functional outcomes. Interestingly, in our sample of women, a history of negative life events was associated with an internal health locus of control orienta-

tion. Further, the lack of association between control orientation and health behaviors does not allow for this mechanism to be used as an explanation for the interactive effect seen in the men. More data are needed to explicate these findings.

Indeed, the fact that internal health locus of control was not associated with most health behaviors or health related activities in either women or men (exceptions being its relationship to changing one's diet when ill and possibly to meditating when ill) challenges some of the beliefs regarding the mechanisms of action of health locus of control. The assumption usually is that having an internal locus of control promotes health seeking and information gathering behaviors. While this has been suggested to hold true mainly for those who value health (Wallston et al., 1976), valuing health, while statistically significantly related to internal health locus of control in both men and women in our study, had no effect on the associations between IHLC and functioning or health related behaviors. Additionally, while internal health locus of control was not associated with most health promoting behaviors, it was positively associated with current smoking for women. These findings are contrary to prediction but congruent with other studies that have failed to show a relationship between internal health locus of control and health promoting behaviors (Gierszewski, 1983; Oberle, 1991; Oldridge & Streiner, 1990).

Several commonalities found between men and women in our study suggest that an internal health locus of control may influence individual daily events more than behaviors that affect functioning over time. For both men and women, higher levels of internal health locus of control were marginally associated with meditating and significantly associated with changing eating patterns when illness was experienced. No relationships were found for taking vitamins, exercising, having a regular physician, or getting regular checkups. This contrast suggests that those with a higher internal health locus of control perceive greater control when activities have an immediate effect in contrast to those which only affect health in the long term.

Along these lines, Wallston, Wallston, Smith, and Dobbins (1987) emphasize that, as a generalized expectancy, health locus of control will not explain much of the variance in health behaviors. This point is supported by the very modest relationships sometimes discussed in the literature (Calnan, 1989). However, there is little discussion regarding the potentially negative effects of an internal health locus of control. If individuals do in fact feel they are in control of their health they may be less inclined to follow the dictates of others and be less responsive to health advice and health advertising. Further, Averill (1973) noted two decades ago that while control usually decreased stress, control increased stress in an important minority of persons.

Another important issue, however, is that control beliefs may not exert their effect on outcomes through health behaviors. That is, some data suggest that perceived control may have a direct effect on physiological status (Rodin, 1986). These direct mechanisms need further research and may help support the findings in our study.

An additional finding in our study is that internal health locus of control decreased with age in women but increased with age for men. The data regarding age and control are conflicting. Thus, while some data suggest that older adults may have less desire for control over their health care (Degner & Sloan, 1992; Smith, Woodward, Wallston, Wallston, Rye, & Zylstra, 1988), research in general does not provide enough evidence as to whether perceived control increases, decreases or stays the same with age (Rodin, Timko, & Harris, 1985). Minimal attention has been given, however, to the potential differences between genders. The fact that women experience greater chronic illness than men and overall decreased functioning in old age compared to men may be a factor in how women perceive control over their health. In our study, number of chronic conditions was not related to health locus of control in either men or women, but men who had experienced more childhood illnesses had a lower internal health locus of control than men without such experiences.

Interestingly, family income had contrasting relationships with internal health locus of control in men and women. In men, increasing levels of income were associated with lower levels of internal health locus of control while in women the relationship was reversed and of less importance. The literature generally associates internality with higher socioeconomic status, including higher education and income (Cicirelli, 1980; Hunter et al., 1980). Our findings suggest a gender difference. However, the variable used in our study focused directly on income and not total wealth, which might have influenced the findings. If the results are valid it is difficult to account for such a gender difference. It may be that income becomes increasingly important to older women as a means for obtaining other important resources, thereby enhancing their sense of being in control of their environment.

There are several limitations in our study that may have influenced the findings. Items from the past (such as childhood illness) were measured by self-report and were not verified by other sources. Measuring items simultaneously at baseline for associations with IHLC obscures possible earlier causal relationships that could have exerted their impact prior to baseline. Our measure of internal health locus of control was limited to two items from the 6-item scale, and these items may not fully reflect the dimensions of internal health locus of control (Marshall, 1991). To minimize this effect and to maximize the relevance of the items selected, the two items used were those that correlated most highly with the total scale and which, when removed, lowered the internal consistency reliability measure the most. The fact that many of the findings correspond to the literature on health locus of control supports the validity of the measure. However, because the items selected may represent a narrow domain, addi-

tional longitudinal study with the full scale would be appropriate.

In conclusion, internal health locus of control appears to be strongly associated with subsequent change in physical functioning in old age for women at all levels of baseline functioning, but for men only with lower functioning at baseline; these relationships are not changed when baseline chronic conditions and health promoting behaviors are controlled. For both men and women internal health locus of control was associated with the importance placed upon good health but had no association with health behaviors at baseline, except at times of illness. Internal health locus of control also had few associations with historical variables except for incidence of childhood illness in men and negative life events in women. Additional longitudinal research is needed on the mechanisms by which internal health locus of control affects physical functioning in older adults and how these mechanisms may differ between men and women.

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