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Health Stresses and Depressive Symptomatology in the Elderly: The Importance of Health Engagement Control Strategies

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The study presents cross-sectional ($N = 127$) and longitudinal ($n = 111$) analyses examining relations between health engagement control strategies (HECSs), depressive symptoms, and health stresses in elderly individuals. HECS was measured as people's behavioral and cognitive investments toward attaining health goals. HECS was related to low levels of depressive symptoms, particularly among people experiencing acute physical symptoms. Moreover, HECS predicted reduction of depressive symptoms over time, and depressive symptomatology predicted negative change in HECS. The findings show that active investments of HECSs significantly moderate the negative affective consequences of health threats. Individuals who are characterized by low levels of HECS and high levels of depressive symptoms may be at increased risk of accelerated decline in their physical and mental health.

Key words: aging, depression, health, control

Physical decline in the elderly and its consequences in terms of psychiatric illness is widely recognized and supported by numerous studies documenting the covariation of physical illness, disability, and psychiatric morbidity (e.g., Dew, 1998; Lenze et al., 2001). In this article, we address the link between health stresses and depressive symptomatology in a sample of elderly individuals living in the community. Drawing on a theoretical model of successful aging (Schulz & Heckhausen, 1996), we suggest that active investments of health-related control striving are a significant moderator that prevent depressive symptomatology in people who confront health symptoms that are potentially manageable. In particular, control strategies aimed at attaining health goals were expected to be an adaptive response in elderly individuals that should critically affect the management of age-related loss. In addition, we considered the possibility that depressive symptomatology itself might result in reduced motivation for managing important health goals (e.g., Bruce, 2000). Thus, we also examined whether health-related control strategies and depressive symptoms reciprocally influence each other.

The Importance of Control Strategies for Successful Development

The life span theory of control is an integrative model for characterizing human motivation from infancy to old age (Heckhausen & Schulz, 1995; Schulz & Heckhausen, 1996). The underlying assumption of this position is that humans wish to produce behavior–event contingencies and thus exert personal control over the environments around them throughout their life spans. (for reviews, see Heckhausen, 2000; Heckhausen & Schulz, 1995; White, 1959).

The life span theory of control distinguishes between primary and secondary control. Primary control targets the external world and attempts to achieve effects in the immediate environment external to the individual. In contrast, secondary control targets the self (Rothbaum, Weisz, & Snyder, 1982) and is aimed at optimizing the individual's motivation and emotion (Schulz & Heckhausen, 1997). Both primary and secondary control may involve cognition and action, although primary control is almost always characterized in terms of behavior engaging in the external world, whereas secondary control is predominantly characterized in terms of cognitive processes localized within the individual.

One of the important functions that primary and secondary control strategies fulfill is that they facilitate goal attainment. Specifically, three types of control strategies have been defined that are expected to facilitate the realization of personal goals (Heckhausen, 1999). First, selective primary control involves the investment of internal resources, such as effort, time, and ability, in order to attain important goals. Second, compensatory primary

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control involves the use of external resources, such as getting help from others or using technical aids, in order to facilitate goal attainment. Third, selective secondary control comprises cognitive strategies aimed at increasing the motivational commitment toward attaining a desired goal by enhancing its value, by devaluing competing goals, or by enhancing perceived control for goal attainment.

Research has shown that primary control (selective and compensatory) and selective secondary control facilitate subjective well-being. In addition, primary control and selective secondary control are often correlated, and their effects on indicators of successful development show comparable patterns (Heckhausen, Wrosch, & Fleeson, 2001; Wrosch & Heckhausen, 1999). It seems likely that these three sets of control strategies work hand in hand in attaining important life goals because they reflect individuals' active engagement in personal goals.

Control strategies aimed at goal attainment are expected to be most adaptive if individuals confront favorable opportunities to realize their goals. In such situations, goal engagement should result in successful goal realization and consequently in high levels of subjective well-being. In contrast, it has been shown that the relations between goal engagement control strategies and subjective well-being are reduced in individuals who face unfavorable opportunities to attain personal goals (e.g., chronic health stress in old age; Wrosch, Heckhausen, & Lachman, 2000). In addition, research has shown that goal engagement control strategies might have positive health implications for the young-old, but that the same strategies appear to be detrimental to health in advanced old age (Chipperfield, Perry, & Menec, 1999). Under such circumstances of sharply reduced opportunities for the attainment of significant goals, Heckhausen and Schulz (1995) proposed a fourth set of control strategies to support individuals' development, that is, compensatory secondary control (e.g., self-protection and goal disengagement). In this article, however, we focus only on those control strategies that are expected to help prevent depressive symptomatology by supporting the attainment of important life goals.

Health Engagement Control Strategies and Depressive Symptomatology in Elderly Individuals

Although the prevalence of major depression among older individuals residing in the community is generally thought to be low, the fact that many older individuals suffer from physical illness and disability places them at risk for clinical depression. Indeed, the prevalence of depression is considerably higher among elderly individuals with specific medical conditions, such as rheumatoid arthritis or osteoarthritis, Parkinson's disease, cardiovascular disease, or stroke (Creed & Ash, 1992; Cummings, 1992; Dexter & Brandt, 1994; Spencer, Tompkins, & Schulz, 1997; Timberlake et al., 1997). In addition, studies that have focused on the functional consequences of physical illness, assessed in terms of limitations in instrumental or basic activities of daily living or in terms of restrictions in normal activities, also have reported high levels of depression (e.g., Alexopoulos et al., 1996; Parmelee, Katz, & Lawton, 1992; Williamson & Schulz, 1995).

The model of depression presented here is derived from the life span model of successful aging (Schulz & Heckhausen, 1996) and emphasizes that the use of control strategies moderates the individual's affective response to age-related loss. The adaptive management of health-related goals is a most critical challenge for successful development in the elderly. Threats to or actual losses in individuals' ability to control important outcomes in their lives should instigate behavioral and cognitive control maintenance strategies to buffer those threats and losses. Given that negative affect can be a direct consequence of failure and loss experiences, depressive symptomatology may emerge when control maintenance strategies are unable to adequately address threats and losses in ways that preserve the primary control potential of the individual (Schulz & Heckhausen, 1997). Thus, among elderly individuals who confront health threats, the investment of high levels of health engagement control strategies (HECSs) should facilitate the achievement of those health goals that are still attainable. As a consequence, older individuals who successfully control their health problems can be expected to develop lower levels of depressive symptomatology than individuals who do not succeed in adaptive management of health-related goals.

Many older individuals suffer from one or more chronic conditions, such as arthritis, hypertension, heart disease, or diabetes (National Center for Health Statistics, 1999), which affect their lives in at least two ways. First, these conditions often result in functional disability, limiting the individual's ability to carry out normal daily activities. Second, they generate acute symptoms, such as pain and difficulty breathing, which may further compromise the individual's quality of life. Although the disabilities resulting from chronic disease are relatively intractable, the symptoms associated with chronic disease and disability are often controllable.

The goal of this study was to explore the relation between HECSs and depressive symptomatology in relation to two types of health stressors: acute physical symptoms that are to some degree manageable and chronic disabilities that provide little opportunity for control. On the basis of our theoretical perspective, we expected that the active pursuit of health goals is an adaptive response when one is confronted with acute physical symptoms, such as pain (see also Scheier & Carver, 2001). In contrast, these same strategies should have little impact in dealing with chronic disability. Thus, we expected that HECS would predict lower levels of depressive symptoms when dealing with acute and potentially manageable health symptoms but would be less predictive of depressive symptomatology if the controllability of the health challenge was extremely limited.

In addition, we considered the possibility that depressive symptomatology itself is a risk factor for future health declines. On the basis of research demonstrating that depression might result in health declines, Bruce (2000) suggested that people who experience depressive symptoms might reduce their motivation to exercise important health-related behaviors. Thus, high levels of depressive symptomatology might also result in reduced striving to control health outcomes.

The Present Study

The present study examined the cross-sectional and longitudinal relations between HECSs and depressive symptomatology in elderly individuals. Good health and functionality are highly desired goals that individuals aspire to throughout the life course. However, elderly individuals can be expected to face increasing levels of health threats and thus to be at risk of developing depressive symptomatology.

First, we expected that the amount of control striving that elderly persons invest in attaining their health goals is a significant factor that moderates the experience of depressive symptomatology. We predicted high levels of HECSs to relate to low levels of depressive symptoms (cross-sectional) and to reduce depressive symptomatology over time (longitudinal).

Second, we expected HECSs to be particularly adaptive in people who face acute physical symptoms. In contrast, HECSs were expected to be less effective in people who confront chronic functional health problems. Thus, no differential relation between HECS and depressive symptomatology was expected to appear as a function of the level of chronic disability.

Third, we examined whether high levels of depressive symptomatology might result in low levels of HECS over time. This hypothesis was based on the assumption that depressive symptomatology might result in low motivation to engage in important health goals. Thus, we expected reciprocal time-lagged effects between HECS and depressive symptomatology that might also be indicative of a downward spiral characterized by low levels of HECS and high levels of depressive symptoms.

Finally, we would like to note that we included several control variables into our analyses that have been shown to affect depressive symptoms in previous research. First, it seems important to note that our sample consisted of elderly individuals who were living with a spouse who had some disability. Although this is not an uncommon situation in old age, the strain associated with providing care can influence depressive symptomatology (Beach, Schulz, Yee, & Jackson, 2000). Thus, to disentangle effects that were related to difficulties that might result from the caregiver situation from more general effects of people's active investments in health goals, we controlled our analyses for the amount of emotional and physical caregiver strain. In addition, we controlled our results for sociodemographic characteristics, such as gender, age, education, and race.

Method

Sampling and Recruitment

Participants were a subsample of the Caregiver Health Effects Study (CHES), a multisite longitudinal study investigating the physical and psychiatric health effects of caregiving (420 women and 399 men). The CHES study was designed as an ancillary study of the Cardiovascular Health Study (CHS), a population-based epidemiological study that assesses the etiology, risk factors, and progression of coronary heart disease and stroke in a large representative cohort of older persons over age 65 living in the community. The basic sampling frame of CHS was obtained from Medicare eligibility lists of the Health Care Financing Administration. The CHS cohort was recruited from four U.S. communities: Forsyth County, North Carolina; Sacramento County, California; Washington County, Maryland; and Pittsburgh (Allegheny County), Pennsylvania (see Tell et al., 1993, for further details concerning the sampling, recruitment, and data collection procedures for the CHS). A total of 5,888 participants were enrolled in the CHS study at baseline (approximately 1,500 participants per site). CHES respondents were recruited from the 3,185 CHS participants who were married and living with their spouse at baseline (1993–1994; for details concerning sampling and recruitment procedures for CHES, see Schulz et al., 1997).

The sample of this study was a convenience sample of 127 older individuals who participated between October 1997 and April 1998 in Wave 4 of CHES in Pittsburgh and Sacramento. All of the study participants were living with a spouse who had some disability. Participants interviewed during Wave 4 were the last 127 caregivers in the Pittsburgh and Sacramento sites of CHES who were asked to respond to the HECS Scale. As compared with CHES caregivers (Wave 4) who were not asked to respond to the HECS Scale, individuals in this study reported no significant difference in regard to depressive symptomatology, gender, and ethnicity. However, study participants were slightly younger (M = 78.17 years vs. M = 79.95 years) and received somewhat more education (M = 16.42 years vs. M = 14.25 years).

One hundred eleven of the 127 individuals participated in Wave 5 of CHES between November 1998 and September 1999. For the current sample, the time interval between Wave 4 and Wave 5 was approximately 14 months (M = 14.31, SD = 2.87). At the time of Wave 4, participants in Wave 5 did not statistically differ from nonparticipants (Wave 5) in most of the variables used in this study (HECS, depressive symptomatology, sociodemographic characteristics, and functional health problems). However, nonparticipants (M = 3.31, SD = 2.24) reported more acute physical symptoms than participants did (M = 2.17, SD = 1.83), $t(125) = 2.27$, $p < .05$. In addition, women (93.5%) were more likely to participate in Wave 5 than men (81.5%), $\chi^2(1, N = 127) = 4.16$, $p < .05$.

Measures

In the present study, HECSs, depressive symptoms, acute physical symptoms, and functional health problems were used as the main variables. In addition, variables shown in previous research to influence depressive symptoms were included as control variables in the analyses (sociodemographic characteristics and caregiver strain). The measures included in the present study are described below. Table 1 displays the means, standard deviations, and ranges of continuous study variables.

We assessed HECSs by using nine items from the health-specific Optimization in Primary and Secondary Control Scales (Schulz & Heckhausen, 1998). These nine items were designed to measure three types of control strategies aimed at attaining health goals: selective primary control (three items), compensatory primary control (three items), and selective secondary control (three items). The specific items of the scale are documented in Table 2. Participants were asked to indicate how true each statement was for them on a 5-point scale, ranging from 1 (*almost never true*) to 5 (*almost always true*). The Cronbach's alphas of the HECS were .73 (Wave 4) and .82 (Wave 5).

To examine whether the nine items of the HECS could be used as a single construct, we first conducted exploratory factor analyses using data from Wave 4. The scree tests of the factor analyses suggested a one-factor

Table 1
Means, Standard Deviations, and Ranges of Continuous Constructs

Construct	*M*	*SD*	Minimum	Maximum
Health engagement control strategies (Wave 4)	4.09	0.54	2.43	5.00
Health engagement control strategies (Wave 5)	4.24	0.59	2.22	5.00
CES–D (Wave 4)	6.88	7.57	0.00	40.00
CES–D (Wave 5)	7.12	7.08	0.00	32.00
Acute physical symptoms (Wave 4)	2.31	1.91	0.00	8.00
ADL and IADL (Wave 4)	0.75	1.28	0.00	6.00
Caregiver strain	0.65	2.39	0.00	18.00
Age (years)	78.17	4.15	71.00	92.00
Years of education	16.42	4.19	4.00	21.00

Note. CES–D = Center for Epidemiological Studies Depression Scale; ADL = activities of daily living; IADL = instrumental activities of daily living.

Table 2
Health Engagement Control Strategies Scale

1. I invest as much time and energy as possible to improve my health. (SPC)
2. I do whatever is necessary to be as healthy as I possibly can be. (SPC)
3. If I have a health problem that gets worse, I put in even more effort to get better. (SPC)
4. If I develop a new health problem, I immediately get help from a health professional (e.g., doctor, nurse). (CPC)
5. When a treatment doesn't work for a health problem I have, I try hard to find out about other treatments. (CPC)
6. When I first notice a health problem, I try to get as much advice as I can from people who might know something about the problem. (CPC)
7. When I decide to do something about a health problem, I am confident that I will achieve it. (SSC)
8. Once I decide what I need to do to improve my health, I avoid things that could distract me from doing these things. (SSC)
9. I often think about how important good health is to me. (SSC)

Note. SPC = selective primary control item; CPC = compensatory secondary control item; SSC = selective secondary control item.

solution with an eigenvalue of 3.05. We further conducted a confirmatory factor analysis (using EQS structural equation modeling software) to estimate how well a one-factor solution would fit the current data. The estimated one-factor model revealed satisfactory fit statistics, $\chi^2(27, N = 127) = 45.34$ (goodness-of-fit index [GFI] = .93; incremental fit idex [IFI] = .91; root-mean-square error of approximation [RMSEA] = .07). All of the loadings were significant at $p < .01$ and ranged between .30 and .76.

To validate the HECS measure, we computed correlations (Wave 4) between HECS and three other constructs that were also assessed in the study: (a) participants' reports about whether they have trouble finding the time to get to the doctor if they think they have a health problem, (b) participants' reports about whether their responsibilities caused them to miss one or more of their doctor's appointments in the last 6 months, and (c) a measure of global perceived control (self-mastery; Pearlin & Schooler, 1978; $\alpha = .73$).[1] Participants who reported high levels of HECS also reported less frequently to have trouble finding the time to get to the doctor ($r = –.26$, $p < .01$) and to have missed one or more doctor appointments in the last 6 months ($r = –.21$, $p = .02$). In addition, high levels of HECS were marginally significantly correlated with high global perceived control ($r = .16$, $p = .08$).

Depressive symptoms were assessed during CHES interviews with the 20-item Center for Epidemiological Studies Depression Scale (CES–D; Radloff, 1977). Participants were asked to indicate how often each statement applied to them during the past week on a 4-point scale, ranging from 0 (*rarely or none of the time*) to 3 (*most or almost all of the time*). Sample items included "I was bothered by things that usually don't bother me," "I felt lonely," or "I felt that everything I did was an effort." For this sample, Cronbach's alphas of .87 (Wave 4) and .86 (Wave 5) were obtained.

We assessed acute physical symptoms by counting the number out of a possible 12 physical health symptoms that participants reported experiencing often in the past month (e.g., chest, back, or joint pain; headaches; shortness of breath). This list of symptoms was derived from the PRIME MD patient questionnaire screener (Spitzer et al., 1994).

We measured functional health problems by asking whether participants had difficulty performing each of six activities of daily living (ADLs; eating, dressing, bathing, using the toilet, getting in or out of a bed or chair, walking around the home) and six instrumental ADLs (IADLs; heavy housework, light housework, shopping, preparing meals, managing money, using the phone). A simple count of the number of the respondent's ADL and IADL difficulties was tabulated for use in the present analyses. Sixty-three percent of the respondents reported no limitations, 15.9% mentioned one limitation, 15.9% reported two or three limitations, and 4.8% mentioned having four or more limitations.

The study also included a measure of physical and emotional caregiver strain. Participants were asked whether they experienced physical and emotional strain if they helped their spouses with respect to the six ADL and six IADL situations. We computed a count variable representing the number of ADL and IADL situations in which the participants experienced either physical or emotional strain.

Finally, four sociodemographic variables were also included in the present analyses as control variables: (a) age; (b) race, coded as 0 for Caucasians (86.6 %) and 1 for non-Caucasians (13.4%); (c) gender, coded as 0 for women (48.8%) and 1 for men (51.2%); and (d) education, coded as the highest grade or year of school ever completed.

Results

In the following sections, we first present the zero-order correlations between constructs used in the cross-sectional and longitudinal analyses. We then present cross-sectional and longitudinal analyses to test our main hypotheses of relations between HECSs and depressive symptomatology in elderly individuals.

Zero-Order Correlations

Table 3 presents the zero-order correlations between constructs used in the analyses. We found positive correlations between HECSs and low levels of depressive symptomatology (as assessed by the CES–D) in Wave 4 and Wave 5 of CHES. In addition, HECS (Wave 4) was correlated with low CES–D in Wave 5, and CES–D (Wave 4) was correlated with low HECS in Wave 5. The correlational analyses also showed that high levels of acute health problems, functional health problems, and caregiver strain (Wave 4) were related to CES–D (Wave 4). In addition, high levels of acute physical symptoms and caregiver strain (Wave 4) were correlated with CES–D (Wave 5). Moreover, Caucasians and higher educated participants reported lower levels of CES–D (Wave 5) than non-Caucasians and less educated participants did. The results further showed that acute health symptoms were positively correlated with functional health problems and caregiver strain. In addition, women reported higher levels of HECS than men did (Wave 4). Finally, we found a negative correlation between age and race, indicating that Caucasians were significantly older than non-Caucasians.

Cross-Sectional Results

To statistically test[2] our hypotheses, we carried out a hierarchical multiple regression analysis using participants' depressive symptom scores (CES–D) as the dependent variable. All constructs used in the analysis were assessed in Wave 4 of CHES. In the first

[1] We only expected a modest correlation between HECSs and global perceived control because high levels of perceived control do not necessarily translate into domain-specific investments of control.

[2] We replaced missing values of predictor variables with the mean values of the constructs. Missing data were related to functional health declines (1 participant), caregiver strain (1 participant), and years of education (1 participant).

Table 3
Zero-Order Correlations Between Constructs Used in Regression Analyses

Construct	1	2	3	4	5	6	7	8	9	10
1. HECS (Wave 4)	—									
2. HECS (Wave 5)	.61**	—								
3. CES–D (Wave 4)	−.28**	−.38**	—							
4. CES–D (Wave 5)	−.33**	−.34**	.78**	—						
5. Physical symptoms (Wave 4)	−.11	−.13	.54**	.41**	—					
6. ADL and IADL (Wave 4)	−.09	−.15	.26**	.14	.38**	—				
7. Caregiver strain (Wave 4)	−.15	−.02	.40**	.27**	.31**	−.03	—			
8. Age	−.01	−.17	−.02	.11	.09	.16	−.05	—		
9. Gender[a]	−.26**	−.14	−.11	−.13	−.14	−.05	−.11	.07	—	
10. Years of education	−.14	.01	−.15	−.21*	−.07	−.03	−.08	−.11	.04	—
11. Race[b]	.12	.07	−.08	−.23*	−.05	.02	−.01	−.37**	.01	−.12

Note. HECS = health engagement control strategy; CES–D = Center for Epidemiological Studies Depression Scale; ADL = activities of daily living; IADL = instrumental activities of daily living.
[a] Gender was coded as 0 = female and 1 = male. [b] Race was coded as 0 = Caucasian and 1 = non-Caucasian.
* $p < .05$. ** $p < .01$.

step, we entered[3] participants' age, gender, race, and years of education as sociodemographic control variables. We then tested, in a second step, the main effects of HECSs, acute physical symptoms, functional health problems, and caregiver strain for significance. In the final step, we entered two interaction terms into the regression equation: Acute Physical Symptoms × HECS and Functional Health Problems × HECS.

Table 4 shows the results of the cross-sectional regression analyses for predicting CES–D. Sociodemographic characteristics explained 5% of the variance in participants' CES–D scores. However, none of the sociodemographic variables significantly predicted participants' CES–D scores. The addition of HECS and health stresses explained an additional 38% of variance in CES–D scores. In accordance with our hypotheses, we found an independent main effect for HECS (see Table 4). Participants who reported high levels of HECS reported low levels of depression (as assessed by the CES–D). We also found significant main effects for acute physical symptoms and caregiver strain, indicating that high levels of acute physical symptoms and caregiver strain were associated with higher scores on the CES–D. The significant zero-order correlation between functional health problems and CES–D scores (see Table 3), however, did not reach significance in the multivariate analysis. This result was related to an overlap of variance between acute physical symptoms and functional health problems: If acute physical symptoms were excluded from the regression analysis, functional health problems significantly predicted CES–D scores in the multivariate analysis.

Table 4
Cross-Sectional Regression Analysis Predicting Depressive Symptomatology (CES–D) by Sociodemographic Characteristics, Health Stresses, Caregiver Strain, and Health Engagement Control Strategies (HECSs)

	CES–D (Wave 4)	
Predictor	R^2	β
Sociodemographic characteristics	.05	
Age	.00	−.08
Gender	.01	−.10
Years of education	.03	−.17
Race	.01	−.13
Main effects	.38	
Physical symptoms (Wave 4)	.11**	.39**
ADL and IADL (Wave 4)	.01	.10
Caregiver strain (Wave 4)	.04**	.22**
HECS (Wave 4)	.05**	−.23**
Interactions	.04	
HECS × Physical Symptoms	.04**	−.25**
HECS × ADL and IADL	.00	.08

Note. Betas represent unique effects in each step of analyses. CES–D = Center for Epidemiological Studies Depression Scale; ADL = activities of daily living; IADL = instrumental activities of daily living.
** $p < .01$.

In accordance with our hypotheses, the addition of the two interaction terms in the final step of the analysis confirmed a significant interaction effect on CES–D between acute physical symptoms and HECS. The interaction between functional health problems and HECS, by contrast, was not significant. To illustrate the significant interaction effect, we plotted the relations between HECS and CES–D one standard deviation above and below the mean of acute physical symptoms, using commonly used regression techniques (e.g., Aiken & West, 1991). Figure 1 shows that HECS was positively related to low levels of CES–D, particularly in participants who reported high levels of acute physical symptoms ($B = –5.25$, $SD = 1.29$, $\beta = –.37$, $p < .01$). In contrast, HECS was not related to CES–D in participants who reported low levels of acute health symptoms ($B = .41$, $SD = 1.62$, $\beta = .03$, $p > .10$).

Longitudinal Results

The results presented thus far lent support to our assumption that individual differences in HECSs are related to depressive symptomatology in elderly individuals. In the cross-sectional analyses, HECS was associated with low levels of depressive symptoms, particularly among elderly individuals who reported high levels of acute physical symptoms. To provide additional evidence for the protective role of HECS, we further examined whether HECS is also related to change in people's depressive symptomatology over

[3] All continuous predictor variables were centered prior to the analysis.

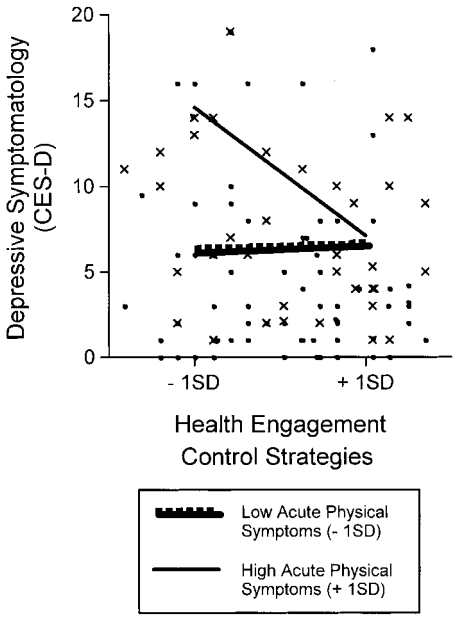

Figure 1. Cross-sectional moderation effect between health engagement control strategies and acute physical symptoms in predicting depressive symptomatology (as assessed by the Center for Epidemiological Studies Depression Scale [CES–D]). The data points represent individuals with high levels (×) and low levels (•) of acute physical symptoms, based on a median split. SD = standard deviation.

time. In addition, we examined whether high levels of depressive symptomatology might result in lower levels of HECS over time.

To test our hypotheses, we carried out two hierarchical multiple regression analyses. The first analysis examined the relations between HECS and longitudinal change in depressive symptomatology. We used participants' CES–D scores at Wave 5 as a dependent variable. We would like to note that the mean value of participants' depressive symptomatology did not significantly change over time. In a first step, we regressed participants' CES–D score from Wave 4 to operationalize change in depressive symptomatology over time. Similar to the cross-sectional analyses, we then included sociodemographic characteristics (Wave 4) into the regression equation. In a third step, we tested the main effects (Wave 4) of HECS, acute physical symptoms, functional health problems, and caregiver strain for significance. We also tested the two interaction terms between health stresses and HECS (Wave 4) for significance.

The results of the analysis are presented in Table 5. Participants' CES–D scores (Wave 4) explained 61% of variance in depressive symptomatology in Wave 5. None of the sociodemographic characteristics significantly predicted change in CES–D. In regard to the main effects (2% explained variance), the results supported our hypothesis that HECS is related to the change of depressive symptoms in elderly individuals. Participants who reported high levels of HECS in Wave 4, as opposed to people who reported low ratings in HECS, showed reduced levels of depression (as assessed by the CES–D) over time. Acute physical symptoms, functional health problems, and reported caregiver strain were not significantly related to change in CES–D scores over time. We did not find significant interactions between HECS and health stresses in predicting change in participants' CES–D scores.

By conducting a second multiple hierarchical regression analysis, we examined whether depressive symptomatology was also related to change in HECS. It seems relevant to note that participants reported significantly higher levels of HECS in Wave 5 as compared with Wave 4, $t(109) = 2.65$, $p < .01$. Similar to the aforementioned analysis, we used participants' HECS scores

Table 5
Longitudinal Regression Analyses Predicting Change in Depressive Symptomatology and Change in Health Engagement Control Strategies (HECSs)

	CES–D (Wave 5)		HECS (Wave 5)	
Predictor	R^2	β	R^2	β
Autoregressions (Wave 4)				
CES–D (Wave 4)	.61**	.78**	—	—
HECS (Wave 4)	—	—	.37**	.61**
Sociodemographic characteristics	.01		.04	
Age	.00	−.01	.03*	−.21*
Gender	.00	−.04	.00	.01
Years of education	.00	−.07	.00	.06
Race	.01	−.11	.00	−.07
Main effects	.02		.07	
Physical symptoms (Wave 4)	.00	.08	.00	.06
ADL and IADL (Wave 4)	.00	−.02	.00	−.06
Caregiver strain (Wave 4)	.00	−.06	.02*	.16*
HECS (Wave 4)	.01*	−.14*	—	—
CES–D (Wave 4)	—	—	.05**	−.30**
Interactions	.00		.02	
HECS × Physical Symptoms	.00	.05	—	—
HECS × ADL and IADL	.00	.02	—	—

Note. Dashes in cells indicate that constructs were not considered at this step of the regression analysis. Betas represent unique effects in each step of the analyses. CES–D = Center for Epidemiological Studies Depression Scale; ADL = activities of daily living; IADL = instrumental activities of daily living.
* $p < .05$. ** $p < .01$.

(Wave 5) as the dependent variable and regressed HECS scores from Wave 4.[4] We then entered sociodemographic control variables into the regression equation. In a final step, we tested the main effects of CES–D, acute physical symptoms, functional health problems, and caregiver strain for significance (all predictor variables were assessed in Wave 4).[5]

The results of the analysis revealed that HECS (Wave 4) explained 37% of the variance of participants' HECS scores in Wave 5 (see Table 5). The addition of sociodemographic characteristics explained 4% of variance in change of HECS. However, only participants' age was a significant predictor, indicating that increase in HECS was particularly found for younger participants. The inclusion of the main effects into the regression equation explained an additional 7% of the variance. As expected by our hypotheses, CES–D score was significantly related to change in HECS. Participants who reported low levels of depressive symptomatology reported increased HECS scores over time. In addition, we found a significant main effect of caregiver strain. Participants who reported higher levels of caregiver strain in Wave 4 increased their levels of HECS in Wave 5. Acute physical symptoms and functional health problems were not related to change in HECS.

Discussion

Our findings showed that HECSs play a critical role in protecting elderly individuals from affective distress when faced with threats to or losses in primary control in important life domains. Participants who invested behavioral and cognitive resources in attaining their health goals reported lower levels of depressive symptoms, particularly if confronted with acute physical symptoms. In addition, HECSs were related to reduced depressive symptoms over time. The longitudinal results also showed that depressive symptomatology might result in reduced levels of HECS. Participants who reported high levels of depressive symptomatology reported lower levels of change in HECS than participants with low levels of depressive symptomatology did. In the following sections, we discuss in more detail the implications of the cross-sectional and longitudinal study results.

Cross-Sectional Results

The cross-sectional analyses showed HECSs, low levels of acute physical symptoms, and low levels of caregiver strain to be related to low levels of depressive symptomatology. People who invested behavioral and cognitive resources in attaining their health goals reported low levels of depressive symptoms. We would like to note that all items of the HECS Scale loaded on one latent factor, indicating that people generally differ in their tendencies to engage in the attainment of health-related goals. It seems likely that people who are generally motivated to engage in their health goals attempt to do whatever is possible to improve their health and to compensate for age-related losses.

In addition, the number of acute physical symptoms and the amount of reported caregiver strain related to high levels of depressive symptoms. These findings replicate results from other studies showing that physical disease and caregiver strain may affect psychiatric morbidity (e.g., Beach et al., 2000; Dew, 1998). In contrast, functional health problems were not predictive of depressive symptomatology in the multivariate approach. However, it should be noted that the zero-order correlations confirmed that acute physical symptoms and functional health problems were both related to high levels of depressive symptoms. The results of the analyses suggest that this finding is, at least partly, related to an overlap in variance between both constructs. People who reported high levels of functional health problems and showed high ratings in depressive symptoms concurrently showed high levels of acute physical symptoms.

In accordance with our hypotheses, we found a significant interaction between acute physical symptoms and HECSs in predicting participants' depressive symptomatology. HECSs were positively related to low depressive symptomatology, particularly among people who reported high levels of acute physical symptoms. In contrast, HECSs were not related to depressive symptomatology in elderly individuals who reported low levels of physical symptoms. We have argued that functional disabilities resulting from chronic disease are more difficult to manage by investment of HECSs, whereas acute physical symptoms associated with age-related loss, chronic disease, and disability are potentially controllable. The findings confirm our hypotheses by demonstrating that among elderly individuals with high levels of acute physical symptoms, those who reported high levels of HECSs showed particularly low levels of depressive symptoms. In contrast, HECSs did not show differential relations with depressive symptomatology between people who confronted low versus high levels of functional disabilities. Thus, the results support our hypothesis that HECSs are most adaptive for older individuals confronting symptoms that are potentially manageable and enhance the individual's ability to pursue other life goals.

More generally speaking, the cross-sectional results are consistent with our broader theoretical perspective that successful development throughout the life-course is characterized by optimization of control strategies such that the primary control potential of the individual is maximized. This general idea has been tested in a number of other specific contexts (e.g., Heckhausen, Wrosch, & Fleeson, 2001; Wrosch & Heckhausen, 1999, 2002; Wrosch et al., 2000), showing that control strategies that were congruent with favorable versus unfavorable opportunities for goal attainment facilitated positive affect and mental health.

Longitudinal Results

The results of the longitudinal analyses further support our hypotheses of the importance of HECSs in preventing depressive symptomatology in elderly individuals. Most important, HECSs were positively related to reduction in depressive symptoms over time. Considering that the mean level of depressive symptomatology did not change across time, this finding implies that people who reported high levels of HECSs in Wave 4 could reduce their levels of depressive symptoms over time. In contrast, people who reported low HECS scores in Wave 4 showed longitudinal increase in their depressive symptomatology. More generally speaking, the findings confirm that individual differences in the use of health-related control strategies are a significant moderator of psychiatric morbidity in old age.

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[4] The analysis is based on 110 participants because 1 participant did not provide data for HECSs in Wave 5.

[5] We did not test interactions between health stresses and depression for predicting change in HECSs because we did not have a priori hypotheses concerning these analyses.

It is important to note that we could not replicate the cross-sectional interaction effect between acute physical symptoms and HECSs in the longitudinal analyses. However, the longitudinal main effect of HECSs on depressive symptomatology was independent of people's levels of acute health stress. This finding implies that, in the long run, HECSs are conducive to low levels of depression for both people who do and people who do not face high levels of acute physical symptoms.

The findings also showed a time-lagged effect of depressive symptomatology on HECSs. Considering that people reported higher mean levels of HECSs over time, the finding indicates that those participants who reported low levels of depressive symptoms in Wave 4 reported enhanced ratings of HECS in Wave 5. In contrast, participants with high levels of depressive symptoms did not show increased use of HECSs over time. This seems to be an important issue, given that the zero-order correlation between HECSs and depressive symptoms was slightly higher in Wave 5 as compared with Wave 4 (see Table 3). These results might indicate that the reciprocal time-lagged effects between HECSs and depressive symptomatology further manifest, or even increase, the negative link between people's active investment of health-related control strategies and depressive symptomatology over time. In addition, it should be noted that depressive symptomatology explained more variance in change of HECSs as compared with the variance explained in change of depressive symptoms by HECSs, although both longitudinal effects were independently present. This finding might imply that it is most important to treat depressive symptoms in the elderly to prevent a person from entering into downward spiral characterized by low engagement in health goals and high depressive symptomatology.

In addition, the longitudinal results showed that participants who reported high levels of caregiver strain in Wave 4 reported enhanced levels of HECSs in Wave 5. It might be that the experienced strain associated with providing help for a disabled spouse might motivate some elderly individuals to invest more control in maintaining and improving their own health.

Limitations and Future Directions

There are a number of issues and limitation that should be addressed in future research. First, although we expect the reported relations between health, control, and depressive symptomatology to apply generally to adaptive development in old age, our empirical support is based on a sample of elderly individuals who provided care for a spouse who had some disability. This sample selection might compromise the generalizability of our findings, given that the strain associated with providing care can relate to depressive symptomatology (Beach et al., 2000). In our analyses, we attempted to disentangle possible sample-specific effect by controlling our findings for caregiver strain. The analyses showed that caregiver strain was indeed related to high levels of depressive symptoms. However, the analyses also showed that the main findings were statistically independent from the amount of strain related to providing care for a disabled spouse. Thus, it is unlikely that the study results can be explained by the specific situation of elderly individuals who have a spouse with some disability. However, it seems important to replicate the study findings in larger and more representative samples of older adults.

Second, this study shows that the amount of control people invest in their health goals relates to reduced levels of depressive symptomatology. However, it should be mentioned that health goals are not always attainable. For example, active engagement in health goals may not affect desired outcomes in later and irreversible stages of disease (e.g., terminal cancer patients). In such situations, it may be more adaptive to disengage from unattainable health goals, to focus on limiting the negative consequences of health problems on daily goal pursuits, and to find purpose in other areas of life (e.g., Heckhausen & Schulz, 1995; Scheier & Carver, 2001). Particularly in highly important and central life domains, such as health, it would be useful to study the break point at which active engagement in health goals may lose its adaptive function and disengagement may become an adaptive process.

A third limitation relates to validity aspects of the HECSs. Although we believe that HECSs measure people's tendencies to actively engage into health-related goals, the study has only limited validity information available. In addition, the presented correlations between HECSs and other health-related constructs (e.g., having trouble finding time to get to the doctor; having missed one or more doctor appointments) provide only very modest evidence for validity. Given that previous research on the adaptive value of control strategies in other domains of life has confirmed much stronger evidence for validity by simultaneously assessing different indicators of control striving (e.g., self-reported goals and cognitive indicators of motivational behaviors; Heckhausen, Wrosch, & Fleeson, 2001; Wrosch & Heckhausen, 1999), future research should adopt a multimethod approach and thereby study validity aspects of the HECS Scale in more detail.

Finally, an important implication of the findings concerns the design of intervention for elderly populations who face health problems. The control strategies identified by our model potentially can be taught to individuals confronting various health challenges. If individuals learn to apply specific control strategies adjusted to their health-related conditions, they may substantially improve their physical and psychological well-being. Indeed, it can be argued that some therapies (e.g., problem solving therapy; Nathan & Gorman, 1998) operate on this principle because they are designed to help the individual identify problems, think through solutions, and then act on them.

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