



## SPOUSAL CAREGIVERS' ACTIVITY RESTRICTION AND DEPRESSION: A MODEL FOR CHANGES OVER TIME

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**Abstract**—In this paper we examine the effects of increasing as well as decreasing caregiving demands on depressive symptomatology. In addition, we focus on spousal caregivers' activity restriction as an explanatory mechanism for changes in depressive symptomatology in the caregiving context. Two databases are used to answer our research questions. An increase of caregiving demands is assessed in study 1, which includes prospective data on 127 spousal caregivers of stroke, hip fracture, congestive heart failure and myocardial infarction patients. A decrease of caregiving demands is examined in study 2, which includes prospective data on 110 spousal caregivers of bypass operation patients. The results generally support the hypothesis that an increase in caregiving demands results in increased depressive symptomatology, while a decrease in caregiving demands reduces depressive symptomatology. The results also support the notion of activity restriction as a critical mediator of changes in depressive symptoms. Cross-sectionally it mediates the association between caregiving and depressive symptomatology, and longitudinally it contributes to changes in depressive symptomatology in both samples. © 1998 Elsevier Science Ltd. All rights reserved

*Key words*—caregiving, activity restriction, spouses, depression, prospective study

### INTRODUCTION

The literature shows clear associations between caregiving and negative mental health outcomes for the caregiver (Schulz *et al.*, 1990; Biegel *et al.*, 1991; Schulz *et al.*, 1995). These findings are based primarily on cross-sectional data, making it difficult to draw conclusions about the mechanisms that might account for this association. Even longitudinal studies tell us little about the effects of caregiving because samples are typically not followed into and out of the caregiving role. Without such critical transition data it is difficult to identify clear mechanisms that might contribute to the onset of depressive symptoms among caregivers. One of the goals of this paper is to describe the effects of taking on the caregiving role or experiencing a measurable increase in caregiving demands, as well as studying the effects of decreasing caregiving demands, on depressive symptomatology. A second goal is to focus on one specific theoretically derived mechanism that might account for increases and decreases in depressive symptomatology in the caregiving context.

Abundant empirical support exists for links between patient's physical functioning and caregiver's depressive symptomatology even though associations are low to moderate (Biegel *et al.*, 1991; Schulz *et al.*, 1995). The usual approach to studying caregiver outcomes is based on stress and coping models (Pearlin *et al.*, 1990). This approach points to a large number of possible explanations, such as the strain associated with caregiving tasks, problem behaviors of the patient and conflicting roles.

In our view, there is another crucial factor that accounts for depressive symptomatology. As described in earlier work (Williamson and Schulz, 1992, 1995; Nieboer, 1997) the disruption of people's life-activities is important in the explanation of depressed affect. Although this focus on activity restriction does not allow us to grasp the full complexity of the caregiving process, it should allow us to explain differences in depressive symptomatology based on observable behavior of caregivers.

Two theoretical models focus on the relation of being able to engage in life activities and individual well-being. Heckhausen and Schulz (1995); Schulz and Heckhausen (1996, 1998) have proposed a life span theory of control as an integrative model for characterizing human development from infancy to old age. The underlying assumption of this position

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is that humans desire to produce behavior-event contingencies and thus exert primary control over the environment around them throughout their life span. They further distinguish between primary control and secondary control. Primary control targets the external world and attempts to achieve effects in the immediate environment external to the individual, whereas secondary control targets the self and attempts to achieve changes directly within the individual. Both primary and secondary control may involve cognition and action, although primary control is almost always characterized in terms of behavior engaging the external world, while secondary control is predominantly characterized in terms of cognitive processes localized within the individual. They emphasize the functional primacy of primary control over secondary control. It is both preferred and has greater adaptive value to the individual. Extensive empirical research shows that striving for primary control is inherently part of the motivational systems of mammals. Negative affect emerges when control maintenance strategies are unable to adequately address threatened or actual losses in primary control. The duration and intensity of the affective response to loss of control depend on the importance of the threatened domains to the individual, and the availability of cognitive and behavioral strategies to attenuate the impact of loss on global levels of control (Schulz *et al.*, 1994). Late life chronic illness and disability represent threats to primary control for both patients and their caregivers inasmuch as the ability to engage in desired activities is frequently curtailed either directly for patient because of illness related factors or indirectly for the caregiver because of caregiving demands. According to this perspective, depressive symptomatology among caregivers is primarily determined by the extent to which desired activities are restricted by the need to support and care for the patient.

Secondly, Lindenberg (1984, 1986, 1991, 1992, 1996) describes two universal goals, physical and social well-being, that operate as a steering mechanism in people's behavior. The social production function theory assumes that people are goal directed while striving for physical and social well-being. Physical and social well-being are general goals, the realization of which is dependent on the fulfillment of instrumental goals in everyday life. Instrumental goals are means of production for these higher level goals: in this case people's activities serve the short- and/or long term production of physical and social well-being. Obtaining physical and social well-being is dependent on people's structural possibilities, i.e. their resources or restrictions (also see Ormel *et al.*, 1997). Since activities are means to obtain well-being, a threat to these means results in increased levels of anxiety. Activity restriction due to caregiving threatens the individual's ability to achieve physical and social well-

being. A threat to one's future capacity to obtain well-being is especially likely to result in symptoms of anxiety (Finlay-Jones and Brown, 1981). For example, a loss of functional capacity of the spouse threatens one's capacity to do the usual activities couples share, such as social activities, sexual activity, and taking a vacation (Nieboer, 1997). In case actual losses occur, and people's capacity to produce well-being is lowered more permanently, symptoms of depression will follow (Brown and Harris, 1978), which, in our view, is the result of the discrepancy between desired and actual outcomes. Therefore, if restrictions occur in the marital relationship they may, eventually, have profound mental health consequences. Depressive symptomatology, according to the social production function theory, results when the ability to strive after important goals is impeded.

If we want to specify the problems people face that result in depressive symptomatology, we need to know how people's capacity to obtain well-being is changed when the caregiving role changes. In order to do so, we investigated changes in important activities in relation to changes in depressive symptomatology.

The leading research questions are as follows:

- (1) Does the onset of the caregiver role or increase in caregiving demands lead to heightened levels of depression? Conversely, does a decrease in caregiver load lead to reduced levels of depression?
- (2) Does activity restriction mediate the relation between caregiving and depressive symptomatology cross-sectionally, and explain changes in depressive symptomatology over time?

Based on past research, we predict that (a) an increase in caregiver tasks results in restricted activity patterns and, therefore, heightened levels of depressive symptomatology (H1), and (b) a decrease in caregiver tasks results in less restricted activity patterns and, therefore, lowered levels of depressive symptomatology (H2).

## METHOD

The ideal test of the hypotheses would include following a population that over time experienced both an increase and a decrease in activity restriction due to caregiving. However, such a dataset is not currently available and, consequently, two databases are used to answer our research questions. Study 1 is used to test H1; it includes 127 spousal caregivers of stroke, hip fracture, congestive heart failure and myocardial infarction patients. Before these health events occurred spouses were not involved in caregiving, however, after the event, many of them became caregivers. Study 2 is used to test H2. It consists of 110 spouses of bypass operation patients. Because many bypass operation patients improve in their functional ability, spouses of these patients are likely to experience a decrease

in caregiving demands. On the whole, these groups move in different directions over time with respect to caregiving demands. In order to make sure that the results of both samples are comparable, important covariates such as age, gender, and physical functioning of the caregiver are controlled in the longitudinal regression analyses.

#### *Method study 1*

The Groningen longitudinal aging study (GLAS) is a population-based prospective follow-up study of the determinants of health-related quality of life of late mid-life and older people, in particular, physical and social disability and well-being (Ormel *et al.*, 1992; Kempen and Ormel, 1996; Kempen *et al.*, 1997). The primary objective is to identify the psychosocial factors that influence the trajectory of quality of life, independently and in relation to disease-related factors.

The study population consists of 8,723 persons aged 57 and older on January 1, 1993, who were in the patient panels of the 27 general practitioners (GPs) participating in the morbidity registration network Groningen (RNG), which operates in the north of the Netherlands. In the Netherlands, approximately 99% of the non-institutionalized elderly are on a GPs panel. By letter, GPs asked eligible subjects for permission to provide their name and address to the GLAS research team. A total of 1,937 refused (22.2%). Of the remaining 6,786, 1,277 declined cooperation when contacted by the research team, and 152 had died or left the GPs care by the time contact was attempted. Another 78 subjects were excluded because of severe cognitive impairments at baseline (MMSE < 17, Folstein *et al.*, 1975). Useful baseline data are available for 5,279 subjects (62% of the study population). All interviews were carried out by well-trained middle-aged women and generally took place at the respondent's home. Subject non-response at baseline was not random but associated with gender (males, 37%; females, 41%) and age (57–69, 34%; 70–84, 42%; 85 and over, 67%). In addition, Relyveld (1996) reported that there were only marginal differences with regard to selective non-response due to morbidity as registered by the general practitioners.

Of all baseline participants 67% reported having a spouse, and 77% of these participants were eligible to enroll in the caregiver study because both spouses were participating. In total 2712 respondents were thus monitored for the illness events under study, and 180 first occurrences of the selected illness events of the spouse were registered by the general practitioners in between March, 1993 and April, 1996. Eight respondents had died before the follow-up interview (4%). And 8 spouses died (4%) in between the date of registration and the follow-up interview. Five respondents (3%) were not interviewed because they were already enrolled in one of the other studies of the program. Finally,

four events were registered too late or the diagnosis was changed before the follow-up interview was administered. Consequently, 155 of the initial 180 cases were eligible to enroll in this sample of the cohort study.

Although respondents signed an informed consent at baseline making their medical information available for the study, not all respondents also agreed to be contacted if an illness event occurred. Eight of the 155 eligible cases had already refused further participation after the baseline interview (5%). In addition, 20 respondents (13%) refused participation when contacted by the research team for the first follow-up after the event. Of the initial 155 enrolled respondents, non-response therefore consisted of 18%. However, analyses of the non-response did not reveal any differences in pre-event predictor or outcome variables (Nieboer, 1997).

For the first follow-up, data are available for 127 caregivers (45 men and 82 women; mean age 70.1, Std. Dev. 7.6). The caregiving sample consists of 35 respondents whose spouse experienced a myocardial infarction, 40 respondents whose spouse suffered from congestive heart failure, 32 whose spouse had a stroke, and 20 respondents whose spouse had a hip fracture. These illness events vary in the extent to which they incapacitate the patient, but the pre-event number of care tasks did not differ significantly between patient groups, nor does the increase in the number of care tasks due to the different illness events (Nieboer, 1997). Most of the variation in care demands can thus be found within each patient group. Follow-up assessment for spousal caregivers occurred at 3 months and 12 months post-event. Here, we only use the caregiver's baseline data (time 1), which was assessed on average 18 months prior to the event (min 1, max 37 months), and his or her first follow-up assessment at 3 months after the event (time 2). Length of time since the baseline interview was controlled in the longitudinal analyses.

*Measures study 1.* The key measures for this analysis were depressive symptoms, number of caregiving tasks and activity restriction. Age, gender and physical functioning of the caregiver are included as covariates in the longitudinal regression analyses.

#### *Depressive Symptoms*

The dependent variable, depressive symptomatology, is measured with the 7-item depression section of the hospital anxiety and depression scale (HADS; Zigmund and Snaith, 1983; Alyard *et al.*, 1987; Spinhoven *et al.*, 1997). All items were rated on a 4-point scale (0–3). The scale is a well validated self-report measurement instruments with sufficient internal reliability. Cronbach's Alpha was 0.71 at time 1 and 0.79 at time 2. Higher scores mean higher depressive symptomatology.

Table 1. Study 1, spousal caregivers of myocardial infarction, congestive heart failure, stroke or hip fracture patients: Depressive symptoms, number of caregiving tasks, activity restriction, and physical functioning of the caregiver at times 1 and 2 ( $N = 127$ )

	Time 1 <sup>a</sup>			Time 2		
	<i>N</i>	mean	std. dev.	<i>N</i>	mean	std. dev.
Depression	127	3.9	3.4	127	4.2	3.8
Number of caregiving tasks	127	1.0	2.2	127	3.6***	3.3
Number of activities/Activity restriction <sup>b</sup>	112	15.4	4.4	112	1.5	1.5
Physical functioning caregiver	127	68.0	28.6	127	68.0	32.8

*T*-test, time 2 differs from time 1: \*\*\* $p < 0.001$ , listwise number of cases 112.

<sup>a</sup>Time 1 assessment on average 18 months prior to the event and time 2 at 3 months after the event.

<sup>b</sup>No *t*-test was carried out, due to different measures.

### Number of Caregiving Tasks

The number of caregiving tasks was measured with respect to 18 (I)ADL items performed by the caregiver for the ill spouse (Kempen and Suurmeyer, 1990; Kempen *et al.*, 1996, e.g. eating, dressing, getting in and out of bed, going to the bathroom, shopping, doing household tasks, preparing meals). Cronbach's alpha for the number of care tasks was 0.83 at time 1 and 0.82 at time 2. Higher scores mean higher number of care tasks.

### Activity Restriction

At baseline, the time use patterns of the respondents were assessed extensively. Out of forty activities, such as attending church, visiting, making phone-calls and going for a walk, respondents selected their six most important life-activities. These activities were the ones respondents would miss the most if they could no longer engage in them. The response options of the original 40 activities were no, every now and then, weekly or daily. Only activities that respondents engaged in weekly or daily could be selected as one of six most important activities. The activities mentioned most frequently in our subsample were reading, watching television, receiving guests, household tasks, biking, going shopping, hobbies, listening to the radio, and visiting (these activities range from 62% to 28% in being mentioned as one of 6 most important activities). At time 1 respondents' total number of activities were used as an indicator of their level of activity. At time 2 the impact of the illness event of the spouse on the respondent's 6 most important activities was assessed. Therefore, activity restriction at time 2 is based on the number of important life-activities on which they spent less time due to their spouse's health problems; range of indicator is 0–6. Higher scores reflect higher activity restriction.

### Physical Functioning

Physical functioning of the caregiver is measured with the physical functioning scale of the medical outcomes studies (MOS; Stewart *et al.*, 1988); range

of indicator is 0–100. Internal reliability at time 1 was 0.78 and at time 2 was 0.85. In addition, this measure was used to compare patient's physical functioning before and after the illness event. Higher scores on the MOS-physical functioning scale mean better physical functioning.

### Results study 1: Depression and increased caregiving tasks

In the first step, the hypothesized changes in depression, caregiving tasks and activity restriction were examined. Second, the mediating effects of activity restriction are tested cross-sectionally. Finally, we examined depressive symptoms over time as a function of caregiver age, gender, physical functioning, number of caregiving tasks and activity restriction.

*Changes in depression, increasing caregiving tasks and activity restriction.* In Table 1, mean values and standard deviations are shown for spousal caregivers of stroke, hip fracture, congestive heart failure and myocardial infarction patients, to examine changes in predictor and outcome variables over time.

In accordance with our expectations, Table 1 shows an increase in the mean number of caregiving tasks after the spouse's health event. In fact, the number of care tasks increases more than 1 task for 53% of the spouses. Although the mean level of depression does not change significantly for the whole sample, it is significantly higher for the 53 spouses with at least 4 caregiving tasks at time 2 (5.1 vs 3.5,  $p < 0.05$ ). In addition, these caregivers average 1.9 out of 6 activity restrictions at time 2, as opposed to 1.1 for the rest of the sample ( $p < 0.01$ ). Moreover, the patient's level of physical functioning decreased significantly (62.4 vs 45.0,  $p < 0.001$ ,  $N = 94$ ).

Before testing the mediating effects of activity restriction on the association between caregiving tasks and depressive symptomatology, we examined the intercorrelations among these variables at time 1 and time 2 (Table 2)\*.

The number of care tasks is associated with depression at time 2, but not at time 1. This may be due to relatively few respondents being caregivers before the event (at time 1 only 9% helped their spouse with at least 4 care tasks). Intercorrelations

\*In the case of associations between depressive symptoms, care tasks and activity restriction, the significance level has been divided by two because the hypotheses make one-sided tests appropriate.

between the number of activities and depressive symptoms at time 1 and between activity restriction and depressive symptomatology at time 2 are significant. Moreover, changes in depressive symptoms are associated with the number of care tasks and activity restriction at time 2.

*Mediating effect of activity restriction.* Regression analyses in Table 3 show the associations between caregiving tasks, activity restriction and symptoms of depression at time 2.

The theoretical model predicts that the relation between caregiving and symptoms of depression is mediated by activity restriction. Analyses revealed that activity restriction does attenuate the effect of caregiving on depressive symptomatology. In other words, caregiving affects both activity restriction and symptoms of depression (Table 3), and caregiving's effect on depression becomes smaller when activity restriction is controlled.

*Depressive symptoms, care tasks, and activity restrictions over time.* Table 4 shows predictors of change in depression over time. Hierarchical regression analyses are presented in which time 1 depression is controlled\*. In addition, time since the first (baseline) interview, age, gender, and caregiver's (change in) physical functioning is controlled. The number of care tasks at time 1 and the increase in care tasks due to the event are also controlled, while the number of activities and time 2 activity restriction of the caregiver are used as predictors for time 2 depression. Here, we test the effect of activity restriction on the change in depressive symptomatology, while controlling for the covariates and the change in caregiving tasks.

Clearly depression at time 1 is the best predictor of depression at time 2. Moreover, how much time passed in between the baseline interview and the event also influences time 2 depression. The larger the time interval the higher the respondent's depressive symptomatology. Moreover, physical functioning is negatively associated with depression, meaning that caregivers who experience a reduction in their own physical functioning have heightened levels of depressive symptomatology. Activity restriction also contributes to changes in depressive symptomatology. When we take age, gender, physi-

\*Even though it would have been possible to use a change score, the approach in which depressive symptoms at time 2 were regressed on depressive symptoms at time 1 was preferred because it retains information about the absolute level of depressive symptomatology. For example, if a change score were used, people with no depressive symptoms before and after the event would receive the same score (0) as people with a high score before and after the event. Correcting for time 1 depression adjusts for this effect by giving people with a higher than average number of depressive symptoms before and after the event a relatively higher score, whereas people below the average receive a negative correction.

Table 2. Study 1, spousal caregivers of myocardial infarction, congestive heart failure, stroke or hip fracture patients: Intercorrelations at  $t_1$ ,  $t_2$ , and  $t_2-t_1$  for symptoms of depression, number of care tasks, age, gender, physical functioning of the caregiver, and activity restriction ( $N = 127$ )

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
$t_1$													
1 Depression	—												
2 Number of caregiving tasks		0.09											
3 Number of activities			0.09										
4 Age				0.06									
5 Gender (female = 0, male = 1)					0.06								
6 Physical functioning caregiver						0.01							
$t_2$													
7 Depression								0.14					
8 Number of caregiving tasks									0.05				
9 Activity restriction										0.05			
10 Physical functioning caregiver											0.07		
$t_2-t_1$													
11 Depression													
12 Number of caregiving tasks													
13 Physical functioning caregiver													

† $p < 0.10$ ; \* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ .

Table 3. Study 1, spousal caregivers of myocardial infarction, congestive heart failure, stroke or hip fracture patients: Mediating effects of activity restriction in the association between number of care tasks and depression at time 2 ( $N = 127$ )

Predictor	Dependent variable	Beta	<i>p</i>
Number of care tasks	activity restriction	0.32	0.00
Number of care tasks	depression	0.25	0.01
Activity restriction		0.25	0.01
Number of care tasks	depression	0.10	ns

cal functioning of the caregiver and depressive symptomatology at time 1 into account, activity restriction is a significant predictor of time 2 depression. As expected, after entering activity restriction of the caregiver into the equation, the effect of caregiving on depression dissipates.

In sum, the spouse's myocardial infarction, congestive heart failure, stroke or hip fracture results in an increase in caregiving demands and related activity restrictions. Depressive symptoms only increase for those caregivers with at least four caregiving tasks after their spouse's health event. Even though higher care demands resulted in a larger increase in depressive symptoms, not all caregivers experienced heightened levels of depressive symptomatology due to their spouse's health event. The results support the notion that activity restriction mediates the association between caregiving and depressive symptomatology, and contributes to depressive symptomatology in spousal caregivers.

#### Method study 2

The goal of study 2 was to examine if a decrease in caregiver tasks results in less restricted activity patterns and, therefore, lowered levels of depressive symptomatology. Spouses of bypass operation patients are likely to experience a decrease in activity restriction due to the relief of caregiving demands, because many of these patients improve in their functional ability.

Five hundred and twenty-eight consecutive patients (354 men and 174 women) scheduled for

coronary artery bypass surgery between January, 1992 and January, 1994 at Allegheny General Hospital in Pittsburgh, PA were asked to participate in the study. Patients in Cardiac Intensive Care, those whose scheduled surgery included procedures in addition to bypass (e.g., valve replacement) or who, at the time of evaluation by the attending physician, reported a current experience of chest pain were ineligible for referral. Of the 528 patients asked to participate, 309 (59%, 215 men and 94 women) agreed and provided informed consent. The average age of participants was 62.8 years (62.3 years for men, 64.1 for women). Participant's median yearly income was \$20,000–\$24,000 with approximately 75% of the households making less than \$45,000 per year. The majority (80%) of participants were married and 74% had at least a high school education.

All referrals were made by the office of the cardiorthoracic surgeon. Baseline interviews were conducted by trained interviewers one to twenty days before the patient's surgery. These interviews occurred either in the patient's home or in the hospital. For patients, follow-up assessments occurred at 6–8 d, 6 months, and 18 months post-operatively. For support persons, follow-up occurred at 6 months and 18 months post-operatively. Before the follow-up interview at 6 months post-operatively, 6 patients had died.

In the present study, the primary support person was identified by the patient as someone who would help or take care of him/her when he/she returned home from the hospital. Of the 309 participating patients, 22 indicated that they did not have a primary support person. It was possible to contact and request participation from 206 of the 287 primary support persons identified by the patients. Of those contacted, 59 (29%) declined to participate, leaving a sample of 147 primary support persons including spouses, children, and other relatives. If the support person agreed to participate, informed consent was obtained and a one-hour self-report questionnaire

Table 4. Study 1, spousal caregivers of myocardial infarction, congestive heart failure, stroke or hip fracture patients: Hierarchical multiple regression analysis of symptoms of depression on changes in physical functioning, care tasks, and activity restriction ( $N = 127$ )

Measures	<i>R</i> square change	<i>F</i> change	Beta		
			step 1	step 2	step 3
Depression at time 2					
step 1: control variables	0.43	13.4***			
Depression $t_1$			0.51***	0.48***	0.48***
Age $t_1$			0.20*	0.17 <sup>†</sup>	0.16 <sup>†</sup>
Gender $t_1$			-0.08	-0.09	-0.10
Time since first interview $t_2-t_1$			0.20**	0.21**	0.20**
Physical functioning caregiver $t_1$			-0.05	-0.08	-0.04
Physical functioning caregiver $t_2-t_1$			-0.20*	-0.19*	-0.12
step 2: care tasks	0.03	2.9*			
Number of care tasks $t_1$				0.15*	0.13 <sup>†</sup>
Number of care tasks $t_2-t_1$				0.15*	0.08
step 3: activities	0.03	2.9*			
Number of activities $t_1$					-0.05
Activity restriction $t_2-t_1$					0.19**
<i>R</i> square for equation	0.49				

Pairwise deletion of missing cases; <sup>†</sup> $p < 0.10$ ; \* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ .

Table 5. Study 2, spousal caregivers of bypass operation patients: Depressive symptoms, number of caregiving tasks, activity restriction, and physical functioning of the caregiver at times 1 and 2 ( $N = 110$ )

	Time 1 <sup>a</sup>			Time 2		
	<i>N</i>	mean	std. dev.	<i>N</i>	mean	std. dev.
Depression	108	9.2	6.5	108	5.9***	5.1
Number of caregiving tasks	107	3.5	2.8	107	3.6	2.6
Activity restriction	107	2.6	3.4	109	1.5***	2.6
Physical functioning caregiver	108	85.2	20.2	108	86.9	20.3

*T*-test, time 2 differs from time 1: \*\*\* $p < 0.001$ , listwise number of cases 98.

<sup>a</sup>Time 1 assessment at one to twenty days before the patient's surgery and time 2 at 6 months post-operatively.

was administered while the patient's interview was being conducted. In this paper data are included on 110 spousal caregivers of bypass operation patients (12 men and 98 women; mean age 58.3, Std. Dev. 10.6) for which data was available for both the pre-operative (time 1) and 6 months post-operative (time 2) assessments. Whether or not the interview took place at the caregiver's home a few weeks before the operation (42%), or a few days pre-operative at the hospital (58%) was included as a dummy-variable in the longitudinal regression analyses reported below.

*Measures study 2.* In the next paragraph, we will discuss the measures for depressive symptoms, the number of care tasks, activity restriction and physical functioning.

#### *Depressive Symptoms*

Caregivers completed the 10-item version of the Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977). All items were rated on a 4-point scale (0–3). Cronbach's Alpha for the CES-D was 0.85 at time 1 and 0.82 at time 2. Higher scores mean higher depression.

#### *Number of Caregiving Tasks*

In study 2, 15 (I)ADL tasks were assessed (e.g. providing assistance with bathing or showering, walking, taking medications). Alpha for internal reliability of providing assistance with (I)ADL was 0.81 at time 1 and 0.80 at time 2. Higher scores mean higher number of caregiving tasks.

#### *Activity Restriction*

For study 2, the activity restriction scale (ARS; Williamson and Schulz, 1992) was administered, which asks caregivers to indicate the extent to which 9 areas of activity (i.e. caring for self, caring for others, doing household chores, going shopping, visiting friends, participating in sports and recreation, going to work, working on hobbies, maintaining friendships) were restricted (0 = never or seldom did this/none, 1 = some, 2 = a lot) by their spouse's illness; range of indicator 0–18. Alpha for internal reliability for the ARS was 0.86 at time 1 and 0.86 at time 2. Higher scores on the ARS reflect higher activity restriction.

#### *Physical Functioning*

The physical functioning scale of the medical outcomes studies was administered (see study 1). Cronbach's alpha for caregiver's physical functioning in study 2 was 0.90 at time 1 and 0.92 at time 2. In addition, this measure was also used to compare patient's physical functioning before and after the bypass operation.

#### *Results study 2: Depression and decreased caregiving tasks*

The same steps were followed to test the second hypothesis. In the first step, the hypothesized changes in depression, caregiving tasks and activity restriction were examined. Second, the mediating effects of activity restriction are tested cross-sectionally. And finally, we examined depressive symptoms over time by caregiver age, gender, physical functioning, number of care tasks, and activity restriction.

*Changes in depression, decreasing caregiving tasks and activity restriction.* In Table 5, mean values and standard deviations are shown for spousal caregivers of bypass operation patients, to examine changes in predictor and outcome variables over time.

Table 5 thus shows the status of bypass patients' caregivers on key predictor and outcome variables before and after the operation. Even though there is no significant decrease in the mean number of caregiving tasks overall, a substantial portion of caregivers (26%) experienced a decrease of at least two caregiving tasks. Time 2 depression is significantly lower for the above mentioned caregivers who, after the operation, carry out at least two tasks less ( $N = 27$ ) than caregivers with similar or increasing numbers of tasks (5.3 vs 7.8,  $p < 0.05$ ). Furthermore, activity restriction is significantly lower at time 2 than it was at time 1 for the whole sample, and the decrease in activity restrictions is significantly higher for caregivers who carry out at least two tasks less than for the rest of the sample (−1.2 vs 0,  $p < 0.05$ ). In addition to the data shown here, a paired *t*-test was carried out on patient data to compare patient's physical functioning before and after the operation. A significant improvement was found (70.9 vs 83.6,  $p < 0.001$ ), which supports the relief of caregiver burden at time 2.

Table 6. Study 2, spousal caregivers of bypass operation patients: Intercorrelations at  $t_1$ ,  $t_2$ , and  $t_2-t_1$  for symptoms of depression, number of caregiving tasks, activity restriction, age, gender, and physical functioning of the caregiver ( $N = 110$ )

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
$t_1$														
1 Depression	—	-0.03	0.33***	-0.28**	-0.14	-0.13	0.48***	0.12	0.24**	-0.05	-0.66***	0.10	-0.18†	0.05
2 Number of caregiving tasks		—	0.28**	0.00	0.02	-0.21*	0.05	0.40***	0.35***	-0.11	0.11	-0.58***	-0.04	0.10
3 Activity Restriction			—	-0.22*	-0.01	-0.18†	0.44***	0.18†	0.58***	-0.24*	0.06	-0.13	-0.66***	-0.10
4 Age				—	0.25**	-0.13	-0.20*	0.00	-0.13	-0.21*	0.16	-0.03	0.15	-0.11
5 Gender (female = 0, male = 1)					—	0.06	0.09	-0.13	-0.09	-0.03	0.21*	-0.14	-0.08	-0.12
6 Physical functioning caregiver						—	-0.22*	-0.17†	-0.17†	0.72***	-0.08	0.05	0.04	-0.38***
$t_2$														
7 Depression							—	0.16*	0.38***	-0.28**	0.35***	0.12	-0.16†	-0.08
8 Number of caregiving tasks								—	0.40***	-0.26**	-0.02	0.51***	0.16†	-0.10
9 Activity restriction									—	-0.19†	0.08	0.03	0.24**	-0.04
10 Physical functioning caregiver										—	-0.19†	-0.13	0.07	0.37***
$t_2-t_1$														
11 Depression											—	-0.07	0.00	-0.12
12 Number of care tasks												—	0.21*	-0.20*
13 Activity restriction													—	0.09
14 Physical functioning caregiver														—

† $p < 0.10$ ; \* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ .

Table 7. Study 2, spousal caregivers of bypass operation patients: Mediating effects of activity restriction in the association between number of care tasks and depression at time 2 ( $N = 110$ )

Predictor	Dependent variable	Beta	$p$
Number of care tasks	activity restriction	0.40	0.00
Number of care tasks	depression	0.16	0.05
Activity restriction		0.37	0.00
Number of care tasks	depression	0.01	ns

Table 6 shows intercorrelations at time 1, time 2, and the change between time 1 and time 2 for spousal caregivers of bypass operation patients.

Here, as was the case in study 1, the number of care tasks is only associated with depression at time 2, not at time 1. The anticipation of a major operation may have resulted in a strong preoccupation with the spouse's health and shifted the importance of caregiving tasks as a predictor of depressive symptomatology to the background. Intercorrelations between activity restriction and depressive symptomatology are significant for both times 1 and 2. However, changes in depressive symptoms are not correlated with changes in care tasks or activity restriction. Apparently the sharp reduction in depressive symptoms makes the use of change-scores problematic.

*Mediating effect of activity restriction.* Regression analyses in Table 7 shows the associations between caregiving tasks, activity restriction and symptoms of depression.

As predicted by our theoretical model the relation between caregiving and symptoms of depression is mediated by activity restriction. In accordance with the findings in study 1, activity restriction also mediates the effect of caregiving on depressive symptomatology in study 2. After controlling for activity restriction, the effect of caregiving on depression dissipated entirely.

*Depressive symptoms, care tasks, and activity restrictions over time.* Table 8 shows predictors of change in depression over time. Here, we test the effect of the change in activity restriction on depressive symptomatology, while controlling for the covariates, and the number of care tasks.

Once again, time 1 depression is the strongest predictor of depression at time 2. Whether the interview took place at the caregiver's home or briefly before the operation at the hospital did not influence our research results. Gender does have an effect on caregiver outcome, men experience a smaller reduction in depressive symptoms. As expected, regression analyses reveal an effect of activity restriction on depressive symptomatology. Activity restriction at time 1 results in heightened levels of depressive symptomatology also after the operation and, although only marginally significant, changes in activity restriction contribute to depressive symptomatology in study 2. Even when we take age, physical functioning of the caregiver and depressive

Table 8. Study 2, spousal caregivers of bypass operation patients: Hierarchical multiple regression analysis of symptoms of depression on changes in physical functioning, care tasks, and activity restriction ( $N = 110$ )

Measures	R square change	F change	Beta		
			step 1	step 2	step 3
	Depression at time 2				
step 1: control variables	0.33	7.7***			
Depression $t_1$			0.43***	0.42***	0.34***
Age $t_1$			-0.19*	-0.19*	-0.13
Gender $t_1$			0.18*	0.20*	0.20*
Home/hospital interview $t_2-t_1$			-0.05	-0.05	-0.08
Physical functioning caregiver $t_1$			-0.27**	-0.25*	-0.19*
Physical functioning caregiver $t_2-t_1$			-0.21*	-0.18 <sup>†</sup>	-0.11
step 2: care tasks	0.01	0.8			
Number of care tasks $t_1$				0.10	-0.02
Number of care tasks $t_2-t_1$				0.14	0.10
step 3: activities	0.07	5.5**			
Activity restriction $t_1$					0.41***
Activity restriction $t_2-t_1$					0.19 <sup>†</sup>
R square for equation	0.41				

Pairwise deletions of missing cases; <sup>†</sup> $p < 0.10$ ; \* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ .

symptomatology at time 1 into account, activity restriction predicts time 2 depression.

In sum, caregivers of bypass operation patients experience a decrease in activity restriction and depressive symptoms after the operation; moreover, a decrease of at least two caregiving tasks results in a significantly higher reduction in depressive symptomatology. By and large, the results support the notion of activity restriction as an important variable in the explanation of depressive symptomatology. Cross-sectionally it mediates the association between caregiving and depressive symptomatology, and longitudinally it contributes to depressive symptomatology in both samples.

#### DISCUSSION AND CONCLUSION

The goal in this study was to examine the importance of changes in caregiving demands and activity restriction as determinants of depressive symptomatology in caregivers. Although our methodological approach to this question is not ideal, it is considerably more powerful than most studies in this area. First, in contrast to the large number of cross-sectional studies in the literature, we used longitudinal methods enabling us to examine changes in key predictor and outcome variables over time. Second, we selected populations experiencing an event that caused the key variable to move in opposite directions. In one sample, an illness event caused increasing demands on the caregiver, and in the other, a medical intervention provided relief from caregiving demands. This should in turn yield corresponding changes in the outcome variable, depressive symptoms, if our hypotheses are correct.

The results generally support the hypothesis that an increase in caregiving demands result in increases in depressive symptomatology, and decreases in caregiving demands result in reductions in depressive symptomatology. More specifically our first hypothesis, that an increase in caregiving demands results in restricted activity patterns and, therefore, high-

tened levels of depressive symptomatology, was partially confirmed. Increased depressive symptoms are reported only among individuals who report high levels of caregiver burden after their spouse's illness event. Thus, depressive symptomatology of spouses of myocardial infarction, congestive heart failure, stroke and hip fracture patients increased only for those caregivers with at least four caregiving tasks after the health event, which suggests a threshold effect. Minor changes in caregiver tasks resulting from the illness did not change activity patterns, and consequently, did not result in increased depressive symptomatology. The second hypothesis, that a decrease in caregiver tasks results in less restricted activity patterns and, therefore, lowered levels of depressive symptomatology, was partially confirmed as well. Activity restriction of spouses of bypass operation patients decreased significantly after the operation, and, consequently, depressive symptomatology decreased. However, only a decrease of at least two caregiving tasks resulted in a significantly larger reduction in depressive symptomatology, suggesting a threshold effect for the relieve of caregiver burden as well.

These findings are consistent with both of the theoretical frameworks presented earlier which emphasize the importance of being able to engage in desired activities as means for achieving individual well-being. From the control perspective of Heckhausen and Schulz (1995); Schulz and Heckhausen (1996, 1998), activity restriction is a fundamental threat to primary control, and should evoke both increased anxiety and depression. The social production function perspective of Lindenberg (1984, 1986, 1991, 1992, 1996) also views activity restriction as a threat to the individuals ability to achieve physical and social well-being. Depressive symptomatology, according to this view, results when the ability to strive after important goals is impeded.

One can also argue that depressive symptomatology may lead to restricted activity rather than vice

versa. In this paper, however, we have posed that activity restriction mainly causes caregivers to develop depressive symptoms. In all likelihood, the process of (temporarily) giving up valued activities is more complex than we could show with only two measurement points. Even though evidence suggests that the disruption of people's life-activities is very important in the explanation of depressed affect (Williamson and Schulz, 1992, 1995), it is also likely that depressed mood exacerbates the extent to which the activities will be restricted. Moreover, our focus on activity restriction neglects other factors influencing depressive symptomatology in caregivers such as the quality of the marital relationship or problem behaviors of the patient. This does not imply that these factors are less relevant in understanding the caregiving process, but our results do imply that the usual stress and coping models should be extended by incorporating activity restriction as an important predictor of caregiver outcomes.

An important implication of the findings of this study is that interventions should specifically be aimed at enabling caregivers to maintain their important life-activities. In many cases, this goal can be achieved without necessarily relinquishing the caregiving role. It may be possible, for example, to identify and facilitate participation in those activities most important to the individual by providing temporary relief from caregiving through professional support services or by allocating caregiving tasks to different family members. Alternatively, interventions could also be targeting toward helping the caregiver redefine the relative importance of different types of activities. To some extent this happens naturally when individuals change aspiration levels and adjust them to realistically available opportunities, but this process could be further facilitated through therapeutic intervention. Although the validity of these methods will have to await the outcome of focused intervention studies, the findings reported here provide valuable insights on how such intervention research might be better focused.

Although our attempt to use quasi-experimental methods to address questions concerning causes of depressive symptoms in caregivers is a significant improvement over previous studies, it is important that we acknowledge some of the limitations of our approach to this question. First, even though well validated measurement instruments were used in both studies, they were not identical in all cases. Moreover, measurement intervals were also not identical for the two samples, although one could argue that they should not be, given the different health events we were studying. Second, the two samples differed substantially in cultural background, one being a Dutch sample and the other an US sample. The samples also varied in age, although we tried to assess the impact of age in our analyses. Despite these limitations, the complemen-

tary and theoretically consistent pattern of findings in this study suggest that the phenomena we have identified are relatively robust.

In conclusion, caregiving itself does not necessarily result in depression. As long as caregivers are able to combine caregiver tasks with their usual important life-activities, their well-being does not deteriorate. Only when the demands of caregiving impose restrictions on the individual's ability to carry on these activities do depressive symptoms increase. The converse is also true. Depressive symptoms decrease when individuals experience relief from caregiving demands, enabling them to engage in important life activities.

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