Gender Differences in Cardiovascular Response to Dementia Caregiving

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Purpose: This study examined gender differences in cardiovascular responses to laboratory-based stress, as well as in ambulatory hemodynamic (i.e., blood pressure and heart rate) functioning among caregivers of persons with dementia. Design & Methods: Participants were 25 men and 25 women caregivers, matched on age, type of care recipient’s dementia, and relationship to the care recipient. After cardiovascular reactivity to a laboratory-based caregiving stressor was assessed, the ambulatory hemodynamic functioning levels of caregivers were measured in caregivers’ natural environments. Results: Female caregivers displayed greater systolic and diastolic blood pressure reactivity to a laboratory-based stress task (i.e., discussing caregiving difficulties) compared with male caregivers (p = 0.01). In contrast, no gender differences were found for ambulatory hemodynamic functioning when aggregated overall or when in the presence of the care recipient. Implications: Laboratory-based findings suggest that female caregivers experience greater blood pressure reactivity to caregiving-related stress than do male caregivers. However, these laboratory-based gender differences may not generalize to differences in hemodynamic functioning in caregivers’ daily lives.

Key Words: Stress, Blood pressure, Heart rate

Cardiovascular reactivity (CVR; sympathetic nervous system activation) reverts to increases in blood pressure and/or heart rate levels in response to an acute stressor and has been implicated in the development of cardiovascular disease (Gerin et al., 2000; Krantz & Manuck, 1984; Manuck, 1994; Matthews et al., 1986). Informal family caregivers of ill or disabled older adults represent a group who generally report high levels of stress and burden (Schulz, Vissin-tainer, & Williamson, 1990; Zarit, 1989), the effects of which have been linked to higher ambulatory blood pressure levels (King, Oka, & Young, 1994) and greater mortality (Schulz & Beach, 1999) compared to noncaregivers. The caregiving literature further suggests that female caregivers report greater stress and burden than male caregivers (Dura, Haywood-Niler, & Keicolt-Glaser, 1990; Fitting, Rabins, Lucas, & Eastman, 1986; Lutzky & Knight, 1994; Miller & Cafasso, 1992; National Alliance for Caregiving & The American Association of Retired Persons [AARP], 1997; Yee & Schulz, 2000), but only a few studies have examined gender differences in laboratory-based CVR to stress among caregivers. Results of these studies have been mixed. In one study that included caregivers, women displayed greater blood pressure reactivity to a laboratory-based emotional stress task compared with men (Vitaliano, Russo, Bailey, Young, & McCann, 1993). Vitaliano and colleagues suggested that the observed gender difference may be the result of the emotional stress task (i.e., discussing family relationships) being more salient for women than men. Yet, other research on caregivers of persons with dementia has failed to detect gender differences in CVR in response to a laboratory-based emotional stress task in which caregiving problems were discussed (Lutzky & Knight, 1994).

In contrast to the caregiving literature, several studies have suggested that men experience greater blood pressure reactivity to laboratory-based stressors compared with women (Allen, Stoney, Owens, & Matthews, 1993; Delahanty et al., 2000; Matthews, Davis, Stoney, Owens, & Caggiula, 1991; Polefrone & Manuck, 1987; Stoney, Davis, & Matthews, 1987). However, this prior research examin-
ing gender differences in CVR in the general population typically focused on young adults; it often did not indicate whether the individuals studied were, like caregivers, experiencing significant daily stressors that could exacerbate physiological responses to stress in the laboratory. The equivocal findings of prior caregiving studies on gender differences in CVR and the unique stress often experienced by older caregivers highlight the need for additional research examining gender differences in CVR among caregivers.

Central to the reactivity hypothesis is the assumption that cardiovascular responses detected in the laboratory generalize to cardiovascular functioning in the natural environment (Manuck & Krantz, 1986; Pickering & Gerin, 1990). According to the "prevailing state model," CVR states in the laboratory are posited to resemble typical cardiovascular functioning as experienced in everyday life (Manuck & Krantz, 1986). Based on this model, it would be predicted that if gender differences in laboratory-based CVR are present, then these gender differences should also be seen in the hemodynamic levels of caregivers in the natural setting. However, others have argued that laboratory-based CVR corresponds to the hemodynamic functioning in the natural environment only during times of stress (Matthews, Owens, Allen, & Stoney, 1992). According to this perspective, it would be predicted that if gender differences in CVR among caregivers are displayed in the laboratory, then gender differences in ambulatory hemodynamic functioning in caregivers should be seen during distressing time periods in the natural setting. In our review of the caregiving literature, we could find no studies assessing gender differences in ambulatory blood pressure and heart rate functioning among family caregivers as experienced in their natural environments. The present study, therefore, provides new information related to whether gender differences exist in ambulatory hemodynamic functioning in caregivers' natural environments.

The purpose of this study was twofold. Because of the relatively small number of caregiving studies previously conducted and equivocal findings, the first aim was to extend prior research by examining gender differences in cardiovascular responses to a laboratory-based emotional stressor among caregivers of persons with dementia, a group particularly vulnerable to the effects of stress and burden (Pearlin, Mullan, Semple, & Skaff, 1990; Schulz & Williamson, 1991). The second aim was to investigate gender differences in ambulatory hemodynamic (i.e., blood pressure and heart rate) functioning in the caregivers' natural environments. As research has found CVR to be relatively stable over time (Kamarck, 1992; Veit, Brody, & Rau, 1997), the present study conceptualized CVR as an individual difference variable.

It was first hypothesized that female caregivers would display greater CVR (i.e., systolic and diastolic blood pressure, heart rate) to a laboratory-based emotional stressor compared to male caregivers. This prediction was based on prior research indicating that women generally report greater stress as a result of caregiving than men. Based on the prevailing state model, it was further hypothesized that women would display greater overall ambulatory blood pressure (BP) and heart rate (HR) levels compared to men. We also tested the alternative hypothesis that gender differences in ambulatory BP and HR functioning would be present only during times of distress. Specifically, the present study examined ambulatory hemodynamic functioning among both male and female caregivers when they were in the presence of their care recipients, a time period previously associated with distress and increased BP among at least some groups of caregivers (King et al., 1994).

**Methods**

**Participants**

Male caregivers were recruited from several counties in Northern California to participate in a cross-sectional study designed to investigate the physiological (e.g., BP) and psychological (e.g., stress) health of men who provide informal care to dementia patients. Male caregivers were recruited from March 1997 through April 1999. Data for the matched sample (i.e., female caregivers of dementia patients) were selected from baseline assessments (recruited from February 1996 to April 1998) of the 100 women participating in the Teaching Healthy Lifestyles for Caregivers (TLC) study, a randomized controlled trial conducted in Northern California that examined the effectiveness of health promotion interventions for female caregivers (for a detailed description see Wilcox & King, 1999). Both male and female caregivers were recruited using a variety of strategies, including newspaper and radio advertisements, posters placed on public transportation, notices sent to Alzheimer's and other caregiver organizations, and newspaper articles describing the research project. Eligibility criteria were similar for both men and women, requiring participants to (a) provide care to a family member or friend diagnosed with some form of dementia (as documented by the care recipient's physician) in the caregiver's home; (b) be 50 years of age or older; (c) not participate in a regular program of physical activity (defined as 3 or more times per week of exercise lasting 20 minutes or more per session over the past 6 months); (d) be free of cardiovascular disease or physical limitations that would hinder participation in light to moderate intensity exercise; (e) be stable on all medications for at least 3 months prior to study entry; and (f) agree to visit the clinical outpatient clinic at Stanford University for a health assessment.

Eighty male caregivers were screened for eligibility, and 69% (n = 55) were found ineligible for participation or did not wish to participate. The primary reasons for ineligibility/nonparticipation among the male caregivers were: not interested (20%), not providing more than 10 hours of informal assistance
(19%), being too active (17%), and not providing care to someone with dementia (15%). Similarly, the primary reasons for ineligibility/nonparticipation among the female caregivers were: not interested (25%), being too active (12%), not providing care to someone with dementia (18%), and not being in the target age range (5%). As some have argued that the effects of gender in caregiving studies may be confounded by the type of relationship to the care recipient (Lutzky & Knight, 1994), each of the eligible men \((n = 25)\) was matched to a woman \((n = 25)\) on type of relationship to the care recipient (e.g., spouse, adult child/parent). Other research has suggested that caregivers of Alzheimer’s disease patients can experience greater caregiving stress and burden compared to caregivers of vascular dementia patients (Vetter et al., 1999). Thus, male and female caregivers were also matched on whether they were caring for someone with Alzheimer’s disease versus other types of dementia (e.g., vascular dementia). Finally, male and female caregivers were matched on age, based on research suggesting that age is linked to cardiovascular reactivity (Uchino, Uno, Holt-Lunstad, & Flinders, 1999). Thus, the present study compared 25 male caregivers with 25 female caregivers.

**Procedure**

Baseline study protocols for the male and female caregivers were identical, with the same research technicians performing the assessments for both. Participants were scheduled for morning clinic health assessments, which included measurement of height and weight, participation in a CVR task, a physical activity interview, and completion of questionnaires. After leaving the clinic (typically around 1:00 p.m.), participants wore the ambulatory BP/HR monitor throughout the day until they retired for the evening.

**Measures**

**Demographics and Health.**—Participants completed a measure of demographic characteristics, including their age (in years), education (in years), annual household income, and ethnicity. They also completed a health history, including current medications.

**Caregiving Characteristics.**—Participants completed a survey focused on various aspects of their caregiving experiences (King & Brassington, 1997). Items used in this investigation included their familial relationship to the care recipient, diagnosis of care recipient (confirmed by the care recipient’s physician), age of care recipient, years or months spent caregiving, hours per week spent caregiving, and type of assistance provided to care recipient.

**Psychological.**—Caregiver burden was measured with the 25-item Screen for Caregiver Burden (SCB; Vitaliano, Russo, Young, Becker, & Mauiro, 1991). It assesses the prevalence of experiences that are common among caregivers of persons with Alzheimer’s disease and the distress associated with each of the experiences (on a scale ranging from 1 = “no distress” to 4 = “severe distress”), thus yielding an objective and subjective burden score. Possible scores on the subjective burden scale range from 25 to 100, with higher scores indicating greater distress related to the caregiving experiences. This measure has adequate internal consistency, reliability, and validity (Vitaliano, Russo, Young, et al., 1991; Vitaliano, Young, & Russo, 1991). Depression was measured with the Beck Depression Inventory (BDI; Beck, Ward, Mendelson, Mock, & Erbaugh, 1961), a 21-item self-report questionnaire. For each item, participants choose one of four statements, graded in terms of severity, that describes their thoughts over the past week. The BDI has been used extensively in clinical as well as community samples and has adequate internal consistency, reliability, and validity (see review by Beck, Steer, & Garbin, 1988). Its psychometric properties are acceptable in noncognitively impaired older populations (Scogin, 1994).

**CVR.**—CVR to a laboratory-based psychological stressor was measured using an interpersonal interview with a trained research technician, a strategy previously used by prior researchers examining CVR among older adult caregivers (Lutzky & Knight, 1994; Vitaliano et al., 1993). During the CVR interview, BP (mm Hg) and HR (beats/minute) levels were assessed in 2-min intervals using a Colin ambulatory BP/HR monitor (Model ABPM-630; Colin Medical Instruments, Plainfield, NJ) attached to the non-dominant arm. The Colin monitor records BP using both oscillometric and auscultatory (Korotkoff sound) methods (White, Lund-Johansen, & McCabe, 1989). As more complete data were obtained through the oscillometric method, and the two methods provided reasonably close reading in the study samples, only readings from the oscillometric method are reported (King et al., 1994).

The CVR protocol proceeded as follows: First, participants were asked to sit alone quietly in a room and listen to relaxing music via headphones for a 10-minute rest period. Following the rest period, the research technician engaged the participant in conversation on a neutral topic for 2 minutes to obtain a recording while the caregiver was talking. Next, participants were asked to speak for about 6 minutes (i.e., task period) on the following topic: “Tell me what frustrates or disturbs you the most or what angers or upsets you about being a caregiver.” The technician gave minimal verbal responses during the task period. An additional 10 minutes (i.e., recovery period) followed the speech task, in which the research technician left the room and the participants sat quietly. After the CVR protocol, participants were asked if they had additional comments or questions concerning the task. As prior research has suggested that aggregating multiple cardiovascular recordings within a particular time period increases measurement reliability (Kamarck, 1992), BP and
HR recordings in the present study were averaged within each time portion of the emotional challenge (i.e., rest, task, recovery) to obtain mean systolic BP (SBP), diastolic BP (DBP), and HR levels.

**Ambulatory BP and HR Monitoring**

Details of procedures for collection of ambulatory monitoring data, described previously (King et al., 1994), will be briefly described here. The ambulatory recording portion of the protocol began typically around 1:00 p.m., following the participants' study assessment visit. The ambulatory BP/HR monitor was programmed to automatically record at one-hour intervals up until the time that the participant retired for the night. The decision to use hourly rather than more frequent recordings was based on information obtained during a prior study with female caregivers (King et al., 1994), in which caregivers indicated that more frequent recordings would create undue burden. To minimize movement artifact that could interfere with BP and HR recordings, participants were instructed to remain in the position (e.g., sitting, standing) they occupied during the initiation of the cuff inflation through end of the inflation, and to minimize movement of the cuffed arm (White et al., 1989). The recorder was placed in a waist-worn belt, with leads to the cuff worn under clothing to minimize disruption or inconvenience.

Participants concurrently recorded psychosocial and health-related information on an hourly basis using a lightweight (440g) pocket computer diary (Casio PB-1000, Casio Corporation, Tokyo, Japan) until they retired for the night (detailed description of the Casio PB-1000 provided by King et al., 1994). The pocket computer was programmed to automatically inform the participant each hour, via a series of auditory beeps, that it was time to complete the diary. At each hour, participants answered a series of questions by touching the computer screen at designated times; the diary took approximately 3 minutes to complete. Information gathered via the computer included who was present (e.g., care recipient, other family members, coworker), position during each BP/HR recording (e.g., sitting, standing), current mood (anger, upset, tension/anxiety, and sadness; 1 = “none” to 10 = “extreme”), level of control over the situation (1 = “low” to 10 = “high”), level of demand of the situation (1 = “low” to 10 = “high”), and physical activity level. The PB-1000 has been found to be an accurate and reliable method of obtaining momentary health-related information in the natural environment in both caregiving (King et al., 1994) and noncaring (Taylor, Fried, & Kenardy, 1990) samples.

**Analysis Plan**

**CVR in Laboratory.**—Descriptive analyses were first conducted to examine male and female caregivers on a number of demographic and caregiving-related variables. To test the first hypothesis (laboratory-based CVR gender differences), the female caregivers’ SBP, DBP, and HR scores were subtracted from the respective SBP, DBP, and HR scores of the matched male caregivers, thus removing any influence of the matching factors. All participants had BP and HR scores for each time period (i.e., rest, task, and recovery). A multivariate analysis of variance (MANOVA) was first conducted for the three outcome measures to test the overall main effect of Gender × Time. Given that individuals can demonstrate different levels of response across different hemodynamic variables (Matthews et al., 1986), the MANOVA test for overall Gender × Time effect was expected to be significant. Two-way ANOVA procedures (Pair × Time) were then conducted for each outcome (i.e., SBP, DBP, & HR). In each analysis, the main effect of Gender (i.e., grand mean) and Gender × Time were tested. When there was a significant Gender × Time effect, contrast analyses were conducted comparing (a) rest versus task scores to further examine gender difference in reactivity, and (b) task versus recovery scores to examine gender differences in recovery following the task. As some have suggested that the use of antihypertensive (including beta blockers and calcium channel blockers) and anxiolytic medication may confound the relationship between gender and CVR (Vitaliano et al., 1993), we also conducted multivariate analyses controlling for the use of these medications. None of the caregivers reported using anxiolytic medication in the absence of antihypertensive medication (one woman caregiver reported using both anxiolytic and antihypertensive medication), and the proportions of men and women using antihypertensive medication were equivalent (see Table 1). As the findings from multivariate analyses (not shown) controlling for these medications were identical to the original analyses (not controlling for medication), only the original analyses are displayed.

**Ambulatory Hemodynamic Functioning.**—To test the second hypothesis (gender differences in ambulatory hemodynamic functioning), two sets of paired sample t-test analyses (men vs matched women) were conducted. For the first set of analyses, ambulatory SBP, DBP, and HR scores were each averaged across the day for each participant. For each outcome measure (i.e., SBP, DBP, and HR), a t-test analysis compared male caregivers with their matched female caregivers. Ambulatory data were missing for one female caregiver, and her respective matched male caregiver was subsequently deleted from analyses. Thus, the sample sizes for the first set of analyses examining ambulatory functioning were 24 male caregivers and 24 female caregivers.

For the second set of analyses, ambulatory SBP, DBP, and HR scores were each averaged only if the caregiver indicated (using the pocket computer) that the care recipient was present during the time the blood pressure was being measured. For each outcome (SBP, DBP, and HR in the presence of the care recipient), a t-test analysis compared male caregivers with their matched female caregivers. Two men and
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five women had missing pocket computer and/or hemodynamic functioning data, and their respective matched pairs were subsequently deleted from analyses. Thus, the sample sizes for the second set of analyses examining ambulatory functioning were 19 male caregivers and 19 female caregivers.

**Results**

In descriptive analyses (Table 1), men and women were comparable in age, years of education, race/ethnicity proportions, household income, hypertension medication use, years of providing care, caregiving burden (SCB; Vitaliano, Russo, Young, et al., 1991), and level of depression (BDI; Beck et al., 1961). The ages of the care recipients and the types of caregiving tasks performed were also comparable. Despite matching on type of relationship with the care recipient, type of dementia, and age, women spent somewhat more hours providing care per week than men (89.5 vs 61.5 h/week, respectively; \( p \leq .05 \)). However, correlational analyses (not shown) indicated that gender differences in hours per week providing care were unrelated to the outcome measures (SBP, DBP, and HR reactivity; \( p \) values \( > .05 \)).

Among the female caregivers, descriptive analyses showed that those who were included were similar to those who were excluded in years of education (\( p = .88 \)), years of providing care (\( p = .60 \)), type of dementia (e.g., Alzheimer’s disease, \( p = .33 \)), level of caregiving burden (subjective: \( p = .25 \); objective: \( p = .37 \)), level of depression (\( p = .16 \)), level of SBP reactivity (task—rest; \( p = .47 \)), DBP reactivity (task—rest; \( p = .33 \)), and HR reactivity (task—rest; \( p = .08 \)). Women included in the present study were more likely to be spouses of dementia patients (\( p < .001 \)) and were older (\( p < .001 \)) compared with women not included.

### Cardiovascular Reactivity in Laboratory

Results of the MANOVA revealed a significant main effect of Gender \( \times \) Time, Pillai’s Trace, \( F(6,94) = 2.26, p \leq .05 \). Results of two-way ANOVA procedures testing the first hypothesis for each outcome measure (SBP, DBP, and HR) are presented in Table 2.

With respect to SBP reactivity, results indicated that Gender \( \times \) Time was significantly related to SBP levels in the laboratory. Contrast analyses revealed that rest SBP levels for men versus women were significantly different from task SBP levels for men versus women. Furthermore, task SBP levels for men versus women were significantly different from recovery SBP levels for men versus women. The SBP reactivity gender differences are displayed in Figure 1. Women experienced greater SBP reactivity (i.e., increase from rest to task periods) compared with men. Although the SBP of men increased significantly from 135.2 mm Hg at rest to 147.3 mm Hg during the task, the increase was not as large as the change in women’s SBP levels (133.3 mm Hg to 152.6 mm Hg). Women also displayed greater SBP recovery fol-

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<th>Table 1. Descriptive Data, by Gender</th>
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<td>Age of care recipient</td>
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<td>No. hours providing care/week*</td>
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<td>Use antihypertensive medication</td>
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<td>Objective burden</td>
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<td>Depression</td>
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* \( p \leq .05 \).

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<tr>
<th>Table 2. Gender and Cardiovascular Responses to Laboratory-Based Emotional Stressor, Summary of ANOVA Results (n = 50)</th>
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<td><strong>Independent Variables</strong></td>
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<td><strong>Gender</strong></td>
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<td><strong>Gender ( \times ) Time</strong></td>
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<td><strong>Contrast analyses</strong></td>
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<td>Gender ( \times ) (Rest vs Task)</td>
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<td>Gender ( \times ) (Task vs Recovery)</td>
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**\( p \leq .01 \); ***\( p \leq .001 \).
Following that task period than did men \((p \leq .01)\); recovery period SBP levels for both men and women were comparable to SBP levels during the rest period.

Turning to DBP reactivity, results indicated that Gender and Gender × Time were significantly related to DBP levels in the laboratory (see Table 2). Similar to SBP reactivity, contrast analyses revealed that rest DBP levels for men versus women were significantly different from task DBP levels for men versus women. In addition, task DBP levels for men versus women were significantly different from recovery DBP levels for men versus women. The DBP reactivity gender differences are displayed in Figure 2. Women displayed greater DBP reactivity (i.e., increase from rest to task periods) compared with men. Women also displayed greater DBP recovery following the stress task compared with men \((p \leq .01)\); recovery period DBP levels were comparable to DBP levels during the rest period.

Concerning HR reactivity, Gender × Time was not significantly related to HR levels (see Table 2). The similar HR reactivity and recovery levels between men and women caregivers are displayed in Figure 3. While HR levels of both men and women increased from rest to task periods, there was no significant difference between men and women in the magnitude (i.e., slope) of the increases from rest to task periods, nor in the magnitude of the decreases from task to recovery periods.

**Ambulatory Blood Pressure/Heart Rate**

Ambulatory BP and HR levels were assessed an average of 7.8 times during the day among the male caregivers. For female caregivers, ambulatory BP and HR levels were assessed an average of 8.1 times during the day, gender difference not significant, \(t(1,47) = -0.61, p = .55\).

Figures 4A–4C illustrate average daily (i.e., overall) ambulatory hemodynamic functioning in male...
and female caregivers (group means, representing the day, were obtained for each participant and then scores were averaged for each gender). In t-test analyses, no significant gender differences were detected for overall ambulatory SBP, \( t(1,23) = 0.46, p = .65 \); DBP, \( t(1,23) = 1.31, p = .20 \); or HR, \( t(1,23) = -0.42, p = .68 \). Taken together, findings indicated that overall ambulatory SBP, DBP and HR functioning were similar for male and female caregivers.

Figures 5A–5C illustrate ambulatory hemodynamic functioning in male and female caregivers when they were in the presence of their care recipients (group means, representing the day, were obtained for each participant when care recipient was present; then scores were averaged for each gender). In t-test analyses, no significant gender differences were detected for ambulatory SBP, \( t(1,18) = 0.18, p = .86 \); DBP, \( t(1,18) = 1.54, p = .14 \); or HR, \( t(1,18) = -0.52, p = .61 \), levels in the presence of the care recipients. Thus, findings indicated that ambulatory BP and HR levels were comparable for male and female caregivers when they were in the presence of their care recipients.

A possible explanation for the failure to detect gender differences in hemodynamic functioning in the presence of care recipients is that levels of caregiver distress and burden among these older caregivers were no different when in the presence versus absence of the care recipients. To explore this possibility, averaged mood (i.e., anger, upset, tension/anxiety, and sadness), control, and demand levels when the care recipient was present were compared to averaged mood, control, and demand levels when the care recipient was absent. A total of 34 male and female caregivers had pocket computer data both when care recipients were present and absent during the time of recording. These analyses revealed that caregivers reported higher levels of anger \( (p \leq .05) \), upset \( (p \leq .05) \), and tension/anxiety \( (p \leq .05) \) when their care recipient was present compared with when their care recipient was absent. In addition, caregivers reported lower levels of control over the current situation \( (p \leq .001) \) and higher levels of demand \( (p \leq .05) \) when their care recipient was present compared with when the care recipient was absent. Taken together, these findings suggest that caregivers experienced greater distress and burden during the time period when the care recipient was present versus absent. Given this, it is possible that comparing male and female caregivers on hemodynamic functioning in the absence versus presence of the care recipient may represent a better reflection of caregivers’ CVR in their natural environments than overall ambulatory levels. However, 7 male and 9 female caregivers in the present sample were either always with the care recipient during the monitoring period \( (n = 10) \) or did not have pocket computer data indicating whether or not they were with the care recipient \( (n = 6) \). Elimination of the matched pairs that corresponded to these 16 caregivers resulted in a significant reduction sample size (by nearly two thirds) and, thus, precluded our ability to assess gender differences in hemodynamic functioning in the absence versus presence of the care recipient.

Discussion

Informal caregivers of ill or disabled older adults can experience significant stress and burden, both acute and chronic (Zarit, 1989). Caregivers of persons with dementia are particularly vulnerable to the experience of stress and burden (Pearlin et al., 1990; Schulz & Williamson, 1991). Furthermore, some research has suggested that female caregivers experience greater stress and burden than male caregivers (Dura et al., 1990; Fitting et al., 1986; Lutzky & Knight, 1994; Miller & Cafasso, 1992; National Alliance for Caregiving & AARP, 1997; Yee & Schulz, 2000). An issue not as well researched concerns gender differences in physiological responses (i.e., CVR) to caregiving stress.

Laboratory results from the present investigation indicated that female caregivers experienced greater BP reactivity in response to a stressor compared with male caregivers. Gender differences were found even after controlling for (i.e., matching on) type of relationship to the care recipient, type of dementia, and age. Although the BP levels of male caregivers increased when discussing caregiving difficulties in the
laboratory, female caregivers’ BP reactivity responses were stronger and more pronounced. Insofar as CVR has been implicated in the development of cardiovascular disease (CVD; Gerin et al., 2000; Krantz & Manuck, 1984; Manuck, 1994; Matthews et al., 1986), the present laboratory findings suggest that female caregivers of dementia patients may be at increased risk of CVD by virtue of their elevated CVR levels.

The laboratory-based CVR protocol (i.e., interpersonal interview) in the present study was analogous to strategies used to detect reactivity in prior caregiving research (Lutzky & Knight, 1994; Vitaliano et al., 1993). The present laboratory findings converge with prior caregiving research indicating that women display greater blood pressure reactivity than men (Vitaliano et al., 1993), and contrast with other studies that have failed to detect gender differences in CVR among caregivers (Lutzky & Knight, 1994). Although caregivers in the present study were similar to the 94 caregivers studied by Lutzky and Knight (1994) in age, ethnicity, type of caregiver (i.e., dementia caregiver), and years providing care, the caregivers in the present study had higher income and education levels. Yet, it remains unclear whether these socioeconomic differences in caregiver samples can explain the differential findings. The present results replicate results obtained by Vitaliano and colleagues (1993), who suggested that salience of the emotional task may explain gender differences in CVR to laboratory-based stress. However, support for this explanation in studies on the general population has been equivocal. Some studies have indicated that gender-relevant stress tasks influence gender differences in CVR (Lash, Eisler, & Southard, 1995; Lash, Gillespie, Eisler, & Southard, 1991), whereas others failed to find a relationship between gender relevance and cardiovascular responses to laboratory-based stress (Matthews et al., 1991). Other possible explanations for gender differences in CVR among caregivers that future investigations could explore include gender differences in psychological (e.g., dispositional factors), physiological (e.g., circulating catecholamines), social (e.g., social support), and caregiving-specific (e.g., frequency of caregiving stressors experienced) characteristics.

The present study also sought to examine whether laboratory-based gender differences in CVR generalized to hemodynamic functioning in the caregivers’ daily lives. Findings from the present study were not consistent with the pattern of results as would have been predicted by the prevailing state model, which posits that CVR states in the laboratory should be similar to conditions typically experienced in everyday life. Overall ambulatory BP and HR levels were not significantly different for male and female caregivers as measured in their natural environments. We also failed to detect gender differences in ambulatory hemodynamic functioning among caregivers when they were in the presence of their care recipients. Thus, the difference between men and women in acute physiological stress reactions displayed in the laboratory was not found to generalize to the daily BP and HR levels of caregivers. Further research is needed to examine if gender differences in laboratory-based CVR generalize to specific situations (i.e., acute daily stressors), rather than more general conditions experienced in caregivers’ everyday lives. Because of the undue burden of more frequent monitoring (King et al., 1994), the present study assessed ambulatory hemodynamic functioning on an hourly basis. Increased frequency of monitoring would, however, enhance power to detect group differences. Future research could also assess gender differences in hemodynamic functioning when the care recipient was absent versus present to better determine if such conditions are more sensitive in evaluating whether laboratory-based CVR findings generalize to the natural environment in this population. A challenge for this assessment strategy is monitoring hemodynamic functioning more frequently and over longer periods of time (i.e., more than one day) to more thoroughly capture hemodynamic functioning in different situations, while also avoiding undue burden.

Some limitations of the present investigation must be acknowledged. First, all participants in the present study were caregivers of dementia patients. It is unclear whether the results would generalize to those providing care to older adults with other types of illnesses or disabilities. As most of the caregivers in the present study were spouses, the extent to which gender differences in CVR found in the present study would generalize to nonspousal (e.g., adult children) caregivers remains unclear. The limited number of male nonspousal caregivers in the study precluded an exploration of this issue. In addition, caregivers were primarily White, well educated, and of middle to high socioeconomic backgrounds. It is possible that male and female caregivers who differ from individuals assessed in our sample may show dissimilar patterns of physiological responses to stress as a result of different cultural and/or life experiences. Secondly, because a cross-sectional design was utilized, we cannot ascertain whether gender differences in CVR emerged following the stress of caregiving or were present prior to the beginning of caregiving. Longitudinal and prospective caregiving research would help to shed light on whether gender differences in CVR emerge or become pronounced during the course of caregiving.

The exploration of gender differences in psychophysiological responses to stress among caregivers warrants further investigation, particularly given the high level of stress often reported by caregivers (Zarit, 1989) and the detrimental health consequences linked to caregiving stress (King et al., 1994; Schulz & Beach, 1999; Schulz et al., 1990). This study contributes to the caregiving literature by providing further evidence that female caregivers experience greater cardiovascular reactivity to a caregiving-specific stressor compared to male caregivers. Additional research is required to clarify and refine when laboratory-based gender differences in CVR among caregivers may generalize to hemodynamic functioning in real life.
References

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