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Spousal Support Satisfaction as a Modifier of Physiological Responses to Marital Conflict in Younger and Older Couples

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We investigated linkages between spousal support satisfaction and affective, cortisol, and blood pressure responses to conflict in two samples, 85 newlyweds and 31 older couples, married an average of 42 years. Couples were admitted to a hospital research unit and provided self-reports regarding the support received from their spouses. After a baseline period, couples engaged in a 30-min conflict discussion during which time blood was drawn for cortisol assessment. After the conflict, newlyweds' blood pressure was measured. Among newlywed wives, greater spousal support satisfaction was associated with smaller changes in negative affect and cortisol responses to conflict. Notably, newlywed wives and husbands demonstrated lower blood pressure after conflict when spousal support satisfaction was higher. In contrast, older husbands (but not wives) exhibited greater cortisol responses when spousal support satisfaction was lower. These relationships provide a window on mechanisms linking marriage and health for men and women across the life span.

KEY WORDS: support; marriage; cortisol; sex differences; aging.

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INTRODUCTION

Studies addressing the physiological mechanisms underpinning social support's salutary outcomes offer substantial evidence for buffering effects on physiological responses to acute and chronic stressors (Cohen and Herbert, 1996; Kiecolt-Glaser *et al.*, 1991; Uchino *et al.*, 1999), as well as direct effects on physiological indices, such as blood pressure (Carels *et al.*, 1998; Steptoe *et al.*, 2000), and endocrine function (Seeman *et al.*, 1994). Much less is known about sex differences in social support and physiological function (Glynn *et al.*, 1999), especially within the context of marriage; spouses have profound effects on one another's well-being, life satisfaction, mortality, and morbidity (Coyne *et al.*, 2001; Levenson *et al.*, 1993). The present study examined husbands' and wives' physiological responses to marital conflict and their association with spousal support satisfaction.

Support plays a critical role within romantic relationships in general, as well as within marriages specifically (Acitelli, 1996; Cutrona and Suhr, 1994; Julien and Markman, 1991; Pasch *et al.*, 1997a). Perceived spousal support adequacy uniquely predicts marital quality (Dehle *et al.*, 2001), but social support within marriage is more strongly associated with marital satisfaction and general well-being for younger and middle-aged wives than husbands (Julien and Markman, 1991). Additionally, recently married women *desire* significantly greater support from their spouses compared to their male counterparts, even though women do not appear to differ in the reported levels of support they *experience* from their spouses (Xu and Burleson, 2001).

These sex differences may persist throughout the life span. Indeed, the link between marital satisfaction and perceptions of spousal support is stronger for older married women than men (Acitelli and Antonucci, 1994). Thus, negative perceptions of spousal support may be damaging to older wives' well-being. In a recent study of older women with osteoarthritis (Martire *et al.*, 2002), negative reactions to spousal support were associated with decreased life satisfaction and fewer self-care behaviors. However, older husbands are apt to rely more on their wives for support than the reverse (Antonucci and Akiyama, 1987). Accordingly, if husbands' perceptions of spousal support deteriorate, they might also experience negative consequences to their well-being.

Few studies have addressed social support processes and physiological functioning of individuals within relationships, but preliminary evidence for sex differences exists. For example, men who received social support from their romantic partners had smaller anticipatory cortisol responses compared to men without support or who received support from a stranger prior to a public speaking task; in contrast, women had increased cortisol responses when receiving support from their partners (Kirschbaum *et al.*,

1995). Other than this study (Kirschbaum *et al.*, 1995), we know of no other research specifically examining the relationships between romantic partner support on men and women's physiological responses to stress.

Examining the stress responses of couples and the potential buffering effects of spousal support would contribute to our understanding of the mechanisms underpinning health outcomes of married individuals. Marital conflict in the laboratory produces substantial changes in cardiovascular, neuroendocrine, and immune function in younger and older adults (Ewart, 1993; Kiecolt-Glaser *et al.*, 1997, 1998), and thus provides an explicitly domain-relevant paradigm within which to study married women and men's effects of support for one another. We examined married couples' satisfaction with the social support they received from their spouses and associations with affective, cortisol, and blood pressure responses to marital conflict in two samples, newlyweds and older adults who had been married an average of 42 years.

Based on evidence that recently married women appear to desire higher levels of spousal support than they currently receive compared to husbands (Xu and Burleson, 2001), we predicted that newlywed wives would report lower levels of satisfaction with spousal support than husbands. In addition, stronger relationships exist between spousal support, marital satisfaction and general well-being for wives than husbands (Julien and Markman, 1991). Thus, we expected that newlywed wives, compared to husbands, would demonstrate stronger relationships between spousal support satisfaction and marital satisfaction, and, when satisfaction was higher, would exhibit less negative affective and lower cortisol and blood pressure responses to conflict.

Although older wives' general well-being and marital satisfaction relate more to spousal support than older husbands' (Acitelli and Antonucci, 1994), older husbands rely more on their wives for support than the reverse (Antonucci and Akiyama, 1987). Consequently, a marital conflict discussion should be more threatening for older husbands who are now engaged in a stressful interaction with their primary—and perhaps sole—emotional support provider. Therefore, greater satisfaction with the support they receive from their wives might serve as a buffer to this threat. We predicted that older wives' satisfaction with spousal support would relate more strongly to marital satisfaction compared to husbands', while older husbands' satisfaction with spousal support would relate more strongly to affective and cortisol responses to conflict compared to older wives' satisfaction. Finally, if increased spousal support satisfaction attenuates older husbands' physiological responses, we expected it also to temper their judgments about satisfaction with the conflict discussion.

Marital satisfaction not only relates to spousal support satisfaction, but also plays a pivotal role in determining spouses' behaviors and judgments,

and spousal support satisfaction often demonstrates influence on spouses' outcomes through this contribution to marital satisfaction (Pasch *et al.*, 1997b). As such, we attend explicitly to the role of marital satisfaction in the associations among spousal support satisfaction and affective and physiological outcomes.

METHOD

This study utilized parallel research methodologies with younger and older couples (previously reported in Kiecolt-Glaser *et al.* (1993, 1997); there were only very minor procedural differences between the two samples. We will first review the methodology for younger couples and then discuss the few ways that procedures for older couples differed.

Newlywed Participant Selection

Endocrinological, autonomic, behavioral, and self-report data were collected from 90 newlywed couples during a 24-h admission at the Ohio State Clinical Research Center (CRC), a hospital research unit. The intensive three-stage process used for screening and recruitment, described in greater detail elsewhere (Kiecolt-Glaser *et al.*, 1993; Malarkey *et al.*, 1994), excluded subjects with any current or past mental or physical health problems. We initially identified couples through Franklin County Court records for the Columbus metropolitan area. We sent letters to demographically "appropriate" couples (first marriage, ages 20–40, no children) who had obtained marriage licenses 4–6 months previously. The first phase of the study was described as a phone survey of newlyweds' health and happiness, and subjects were told that they would be paid $10 per couple for interviews concerning their physical and mental health if they returned an enclosed postcard; 2249 individuals were interviewed of 4758 who received letters, representing a 47% response rate. Eight percent of the couples who returned our original postcards were eventually admitted to the CRC.

For our final sample, the average age of wives and husbands was 25.21 (SD = 3.01) and 26.13 (SD = 3.05), respectively (range = 20–37). Couples were well-educated: 6.1% were high school graduates, 23.3% had some college training, 53.3% were college graduates, and 17.2% had additional postgraduate training. The average couple's combined income was $43,464 (SD = 16,739). The majority were white (95%). Couples dated an average of 36.58 months (SD = 25.32) before marriage, and 55 couples (61.11%) lived together before marriage. An average of 10.44 months (range = 6–14) elapsed between their marriage and their Y1 CRC admission. CRC

evaluations were scheduled during the follicular phase of the woman's menstrual cycle (days 5–9). Couples were paid $350 for their time in the CRC. Five couples had missing social support data due to an erroneous instruction in the early stages of the study to complete the social support measure without regard to one's spouse; therefore, for the analyses, the final sample consisted of $N = 85$ couples.

CRC Admission and Conflict Discussion

Subjects were admitted to the CRC at 7:00 A.M., and a heparin well was inserted in each subject's arm. We asked couples not to drink or eat anything after midnight the night before their CRC admissions. Following insertion of the heparin well, a 1 1/2 h adaptation period ensued, during which time subjects completed a battery of questionnaires and relaxed quietly while reading magazines and newspapers. Following the adaptation period, subjects were positioned in chairs facing each other in front of a curtain. The couples completed several questionnaires, and then sat quietly for 10 min.

At the end of the baseline period a psychology graduate student or postdoctoral fellow conducted a brief interview (10–20 min) to help identify the best topics for the problem discussion. Based on this interview and the couples' independent ratings of their disagreements about common relationship issues (e.g., in-laws, finances, leisure time), couples were asked to discuss and try to resolve the two or three marital issues that the interviewer judged to be the most conflict-producing. During the 30-min problem discussion that followed immediately, the research team remained out of sight behind a curtain. All couples discussed problem areas for 30 min; if couples were unable to continue a discussion about a particular issue for any reason (e.g., a couple no longer wished to talk about the problem), the interviewer returned to the couple and provided them with another problem area mentioned during their interview and the discussion continued. No couples resolved problem areas during this 30-min discussion.

Psychosocial Measures

Social Support

The Social Support Questionnaire (SSQ; Sarason *et al.*, 1983) was administered to participants on the morning of their CRC admission prior to the interview and conflict discussion. The SSQ is designed to measure the number of social support sources available to individuals, as well as their

satisfaction with available support. Participants are asked (a) to list all of the people they can count on for support in different domains (e.g., Who do you know whom you can trust with information that could get you in trouble?) and their relationship with the individual, and (b) to rate on a 6-point scale how satisfied they are with each person's support. Average satisfaction with spousal support was calculated by summing the satisfaction scores for spouse support and dividing by the number of times the spouse was mentioned as a source of support.

We chose this method for determining overall satisfaction for a few reasons. First, the majority of respondents listed a spouse as someone they relied upon for support in most domains: only 8% of newlywed wives, 20% of newlywed husbands, 10% of older wives, and 13% of older husbands did not list their spouses as support providers in two or more domains, and all spouses listed spousal support in at least 50% of the domains. This distribution of responses circumvented a situation wherein a respondent could have listed his or her spouse only once and received a higher average satisfaction score than someone who listed a spouse in all domains, resulting in a potentially problematic conception of spousal support satisfaction. Second, given our stringent eligibility criteria, our couples represented very mentally and physically healthy married individuals and were quite satisfied with their marriages in general. As such, we were less concerned with the number of domains in which they relied upon their spouses for support, assuming that for the spouses who did not list their wives or husbands for all domains, negotiating the receipt of support within all domains was not a critical marital issue. This assumption seems feasible given correlational analyses with both newlyweds and older adult couples that revealed no associations between marital satisfaction and number of instances a spouse was listed as someone upon whom the respondents relied for support. Thus, we focused on how satisfied spouses were with the support received within domains in which they did rely on their spouses for support.

Affective Responses

The Profile of Mood States (POMS; McNair *et al.*, 1981), one of the best self-report measures for identifying and assessing transient, fluctuating moods, was administered at baseline before the interviews began and again at the end of the conflict task. The POMS measures six identifiable and factorially distinct affective states, has excellent norms, and psychometrically is very strong in terms of both reliability and validity. The POMS examines the mood states of Tension-Anxiety, Depression-Dejection, Anger-Hostility, Vigor-Activity, Fatigue-Inertia, and Confusion-Bewilderment. The separate

scales were combined to yield a total mood disturbance score (McNair *et al.*, 1981). Higher scores indicate greater negative mood states (or mood disturbance). At baseline, spouses were asked to respond to the items with regard to how they "had been feeling during the past week including today," while the postconflict assessment required spouses to answer with regard to how they "are feeling right now." Response options were "not at all," "a little," "moderately," "quite a bit," and "extremely."

A 30-item version of Differential Emotions Scale (DES) (Izard and Bartlett, 1972) was administered before and after the conflict discussion to assess spouses' current emotion experience. Scores on subsets of items were used to derive total distress (e.g., scared, fearful, downhearted, etc.) and total anger (e.g., angry, enraged, contemptuous) scores. The DES was included as an affective assessment measure after the first 24 newlywed couples had completed the study; therefore, analyses using distress and anger scores include 61 couples.

Marital Satisfaction

The Marital Adjustment Test (MAT; Locke and Wallace, 1959), used to assess marital satisfaction, was administered during the initial telephone screening interview. The MAT is widely used in marital research because of its reliability and validity in discriminating satisfied and dissatisfied couples (Krokoff, 1989). Lower scores indicate lower marital satisfaction.

Cortisol and Blood Pressure Measures

Blood Sampling Protocol

For frequent, unobtrusive cortisol sampling during the interaction tasks, a long polyethylene tube was attached to the heparin well, allowing nurses to draw blood samples at set intervals, out of subjects' sight. During the marital interaction tasks the couples were seated facing each other in front of a curtain, with the polyethylene tubes easily accessible to two nurses who sat behind the curtain. Two psychology team members were also seated behind the curtain during the interviews, monitoring the videotaping and adjusting the remote-controlled cameras.

Approximately 90 min after the heparin well had been inserted, subjects were asked to sit quietly in the chairs used for interviews for 10 min, and then the baseline blood samples were drawn. At the end of the 10–20 min interview, and immediately before the 30-min problem-solving or

conflict task, the second blood sample was drawn; the third and fourth samples were drawn 15 min after conflict began and again at the end of the 30-min conflict task. We calculated mean plasma cortisol level based on the blood samples from the beginning, middle, and end of conflict and used this aggregate value, as well as the cortisol level at baseline, for the main analyses. In the newlywed sample, four wives' and one husbands' cortisol responses were greater than 3 standard deviations from their respective means and were considered extreme values; these spouses were excluded from the analyses.

Cortisol Assays

The cortisol assays were performed in an investigator's (WBM) laboratory with methods that have been used for several years. Plasma cortisol was assayed using a fluorescent polarization technique (TDX – Abbott Lab, Chicago, IL). This assay has a sensitivity of 0.5 ug/100 mL and an intra- and interassay coefficient of variation of less than 10%. The coefficients of variation of these assays were calculated using at least one high and low serum control sample.

Blood Pressure

Blood pressure was measured manually by a research nurse using a standard stethoscope, cuff, and sphygmomanometer at the end of the baseline period and immediately after the conflict task ended (i.e., 30 min after the start of conflict). We did not assess blood pressure in the study of older adults.

Older Adult Couples: Demographics

The subjects, 32 older couples who ranged in age from 55 to 75, were recruited from newspaper advertisements, notices posted in senior citizen centers, and referrals from other participants. The resulting sample of couples had a mean age of 66.75 (SEM = 0.62), had been married 42.28 years (SEM = 1.67), and had 11.26 (SEM = 0.85) years of education.

We excluded subjects who were taking beta blockers or calcium channel blockers because they could interfere with sympathetic nervous system (SNS) responses to conflict. Similarly, eight older adult subjects (five men, three women) were Type 2 (noninsulin dependent) diabetics, recruited for a pilot study on diabetes; their data were excluded from the endocrinological

analyses because of the commonly observed alterations in SNS responses and endocrine function. Eighteen of the women in the sample were taking estrogen and/or Provera supplements; women on supplements were evaluated during the estrogen only phase of their cycle. Other prescription medications taken by older adult subjects included diuretics (two women, two men), thyroid supplements (two women), nonsteroidal anti-inflammatory medication for arthritis (three women, three men), and antacids (two women, two men). Two wives and two husbands, each from different couples, did not complete ratings of spousal support. This resulted in a final older adult sample of $n = 30$ wives and $n = 30$ husbands for the individual-level analyses and $n = 28$ couples for the couple-level analyses.

Older Adult Couples: Differences From Newlywed Protocol

Older adult couples did not respond to the POMS (McNair *et al.*, 1981), nor did they have blood pressure responses measured after conflict. At the end of the conflict discussion, older wives and husbands responded to a series of questions assessing their perceptions regarding particular outcomes of the discussion. Each spouse responded to the following questions on a scale from 1 (*not at all*) to 5 (*completely*): (a) How satisfied are you with the discussion you just had with your spouse?; (b) How satisfied are you with the outcome of the discussion you just had with your spouse?; (c) To what extent do you feel your partner understood you during your discussion?; (d) To what extent do you feel your partner supported you during the discussion? A composite satisfaction with discussion outcomes score was computed by averaging scores on these four items.

RESULTS

Descriptive statistics for all self-report measures are reported in Table I. It is noteworthy that our couples overall were highly satisfied with their spousal support. Spousal support satisfaction score ranges were on the upper end of the 6-point continuum (newlywed wives: range = 4.60–6.00; newlywed husbands: range = 4.47–6.00; older wives: range = 4.50–6.00; older husbands: range = 4.20–6.00). We believe the highly satisfied nature of our spouses reflects our stringent physical and psychological inclusion criteria.

In addition, we note a seemingly unwarranted decline in mood disturbance scores from preconflict to postconflict. However, we believe the declines in negative affect reflected in the scores from pre- to postconflict reflect our couples' initial apprehension about our protocol and the clear

Table I. Means and Standard Deviations for Newlyweds' and Older Couples' Self-Report Measures

	Wives		Husband	
	M	SD	*M*	SD
Newlyweds ($N = 85$)				
Spousal support satisfaction	5.63	0.37	5.66	0.38
Marital satisfaction	129.98	13.86	127.67	15.17
Mood disturbance				
Preconflict (during past week)	11.84	18.55	9.64	18.80
Postconflict	6.92	15.35	4.13	14.98
Anger				
Preconflict	9.52	1.23	9.98	1.79
Postconflict	10.15	2.41	9.98	1.95
Distress				
Preconflict	6.55	1.25	6.62	1.39
Postconflict	7.17	1.78	7.30	2.02
Older spouses ($N = 30$)				
Spousal support satisfaction	5.62	0.47	5.61	0.49
Marital satisfaction	121.52	24.51	123.71	17.67
Anger				
Preconflict	10.61	3.16	9.77	2.08
Postconflict	10.06	2.83	10.87	6.65
Distress				
Preconflict	7.56	2.29	6.56	1.59
Postconflict	7.37	2.17	6.77	1.43

stressfulness of our procedures (hospital admission, insertion of a catheter, and awareness that they would be videotaped while discussing a marital problem). Thus, after accomplishment of these major hurdles, subjects' self-rated negative affect declined (see also Kiecolt-Glaser *et al.*, 1993). Therefore, the analyses should be interpreted as assessing relative differences in declines in negative mood states.

Satisfaction With Spousal Support

Newlyweds

Two analyses were performed to determine whether husbands reported greater spousal support satisfaction than their wives. First, to examine the relative satisfaction within couples, the ratio of wives' spousal satisfaction to husbands' spousal satisfaction was computed. Couples with a ratio of 1 (indicating equal spousal satisfaction) were excluded ($n = 8$). For 58% of these couples ($n = 39$) with discrepant satisfaction scores ($n = 67$), husbands reported more satisfaction with their spouse support relative to wives, while

for 42% of these couples ($n = 28$), wives reported greater satisfaction with spouse support relative to husbands; this difference was not statistically significant, $X^2(1, N = 67) = 1.81$, ns. Next, a paired samples t-test indicated that across all couples, overall satisfaction with spousal support did not significantly differ for wives and husbands ($t(72) = -0.47$, ns).

Older Adults

As in the newlywed study, the ratio of wives' spousal satisfaction to husbands' spousal satisfaction was computed, but because of the smaller sample size, we only present frequencies of couples. Couples were fairly evenly split: for nine couples, husbands reported greater spousal satisfaction than their wives, 10 couples had wives who reported greater satisfaction with spousal support than their husbands, and nine couples had identical scores for spousal satisfaction. Finally, a paired samples t-test indicated that across all older adult couples, wives and husbands did not report differences in their overall satisfaction with the support they receive from their spouses ($t(28) = -0.05$, ns).

Spousal Support and Marital Satisfaction

Newlyweds

A Fisher's z test indicated that wives' correlation between satisfaction with spousal support and marital satisfaction ($r = 0.48$, $p < 0.01$) did not differ significantly from husbands' correlation between the variables ($r = 0.36$, $p < 0.01$).

Older Adults

Correlations between spousal support satisfaction and marital satisfaction for older adult spouses indicated that wives' satisfaction with spousal support significantly and positively related to marital satisfaction ($r = 0.43$, $p < 0.05$), but husbands' did not ($r = 0.23$, ns).

In order to determine the unique contribution of spousal support to variance in central variables and to examine whether marital satisfaction may mediate associations between spousal support and outcomes, marital satisfaction was partialled out in a second step (see Baron and Kenny, 1986) in all subsequent analyses addressing spousal support satisfaction and affect and physiological variables.

Spousal Support and Affective Response to Conflict

Newlyweds' Affective Response to Conflict

Partial correlations for the newlywed and older couple analyses examining affective response are depicted in Table II. Marital satisfaction completely mediated the observed associations between spousal support and mood disturbance, as well as spousal support and anger: after partialling out marital satisfaction and preconflict scores in the correlation analysis, the correlation between wives' spousal satisfaction and mood disturbance was no longer significant, nor was the correlation between anger and spousal support satisfaction, although the association remained moderate ($p < 0.10$) and might be considered a partial mediation effect. Wives' distress was only moderately associated with spousal support ($p < 0.10$); this weak association disappeared after controlling for marital satisfaction. There were no significant correlations between husbands' total mood disturbance, anger or distress and spousal satisfaction after controlling for preconflict scores and when additionally controlling for marital satisfaction.

Table II. Partial Correlations Between Newlyweds' and Older Couples' Spousal Support Satisfaction and Affective Response to Conflict

Variable and spouse	Satisfaction with spousal support	
	Controlling for preconflict scores (df = $n - 2$)	Controlling for preconflict scores and marital satisfaction (df = $n - 3$)
Newlyweds		
Mood disturbance		
Wife	−0.23*	−0.14
Husband	−0.13	−0.04
Anger		
Wife	−0.27*	−0.25†
Husband	0.05	0.17
Distress		
Wife	−0.25†	−0.15
Husband	−0.06	0.05
Older spouses		
Anger		
Wife	0.03	0.14
Husband	0.03	−0.03
Distress		
Wife	−0.33†	−0.30
Husband	−0.23	−0.16

Note. $N = 85$ newlywed couples, $N = 30$ older couples; preconflict scores and marital satisfaction were partialled from all correlations.
* $p < 0.05$; † $p < 0.1$.

Older Adults' Affective Response to Conflict

There were no significant correlations between wives' or husbands' anger DES scores and spousal satisfaction after controlling for preconflict scores and marital satisfaction, although there was a marginal trend toward a negative relationship between wives' spousal satisfaction and distress after conflict ($p < 0.1$) that disappeared after controlling for marital satisfaction. Husbands' anger after conflict had no association with spousal support.

Spousal Support and Physiological Responses to Conflict

Descriptive statistics for all physiological measures are depicted in Table III. A few considerations are worth noting in the interpretation of pre- and postconflict measures. Preconflict blood pressure was measured at the end of the baseline period and before the 10–15 min interview to determine the topics for discussion and postconflict blood pressure was measured at the end of the 30-min discussion. Therefore, pre- and postconflict measures were separated by a minimum of 40 min and sympathetic activity indicators (including epinephrine and norepinephrine) from prior analyses of these data revealed an overall decline across the conflict discussion in sympathetic activity, especially for husbands (see Kiecolt-Glaser *et al.*, 1993). As noted in Table III there was also a decline in newlyweds' cortisol levels from

Table III. Means and Standard Deviations for Newlyweds' and Older Couples' Physiological Measures

	Wives		Husbands	
	M	SD	*M*	SD
Newlyweds ($N = 85$)				
Systolic blood pressure				
Preconflict	109.16	9.46	118.43	10.31
Postconflict	109.57	11.5	116.40	10.58
Diastolic blood pressure				
Preconflict	70.88	10.13	76.36	8.62
Postconflict	71.64	9.77	76.85	9.66
Cortisol				
Preconflict	18.98	8.69	12.12	4.58
During conflict	16.66	8.27	10.44	3.56
Older spouses ($N = 30$)				
Cortisol				
Preconflict	14.16	5.88	12.86	4.21
During conflict	14.62	4.88	13.46	3.24

preconflict to levels during conflict that likely reflects the normal diurnal fall from the early morning peak (see Kiecolt-Glaser *et al.*, 1993). Thus, results should be interpreted as reflecting overall levels of physiological measures at the epoch of interest (controlling for preconflict levels), rather than reflecting acute reactivity to the conflict discussion that can be assessed in terms of its significant difference from baseline. Interestingly, the lack of decline in older spouses' cortisol across the time period from baseline through conflict is noteworthy, and may reflect a greater degree of HPA activity in response to the conflict task relative to the younger spouses, although this is merely speculative at this stage of research.

Partial plots of the association between cortisol during conflict and newlyweds' and older couples' spousal support satisfaction are depicted in Fig. 1. Partial plots of newlyweds' blood pressure after conflict as a function of spousal support satisfaction are depicted in Fig. 2.

Newlyweds' Cortisol Response During Conflict

Partial correlations were performed to determine the relationship between newlywed wives' and husbands' cortisol response during conflict and satisfaction with spousal support. Wives' satisfaction with spouse support correlated significantly and negatively with wives' cortisol response during conflict when controlling for baseline cortisol values ($pr = -0.34$, $p < 0.01$), and this relationship remained significant after also controlling for marital satisfaction ($pr = -0.27$; $p < 0.05$), although the reduced association indicated partial mediation of marital satisfaction. There was no significant relationship between husbands' satisfaction with spousal support and cortisol response during conflict when controlling for baseline cortisol ($pr = -0.07$, ns).

Newlyweds' Blood Pressure After Conflict

Spousal support satisfaction correlated significantly and negatively with wives' DBP after conflict when controlling for baseline DBP values ($pr = -0.26$, $p < 0.05$), and remained significant after controlling for marital satisfaction ($pr = -0.30$, $p < 0.05$). Contrary to our prediction, husbands' DBP after conflict was also associated with spousal support satisfaction ($pr = -0.28$, $p < 0.05$), but this association was reduced after controlling for marital satisfaction ($pr = -0.22$, $p < 0.10$). There were no significant relationships between wives' or husbands' satisfaction with spousal support and their SBP after conflict when controlling for baseline values (wives: $pr = -0.10$, ns; husbands: $pr = 0.01$, ns).

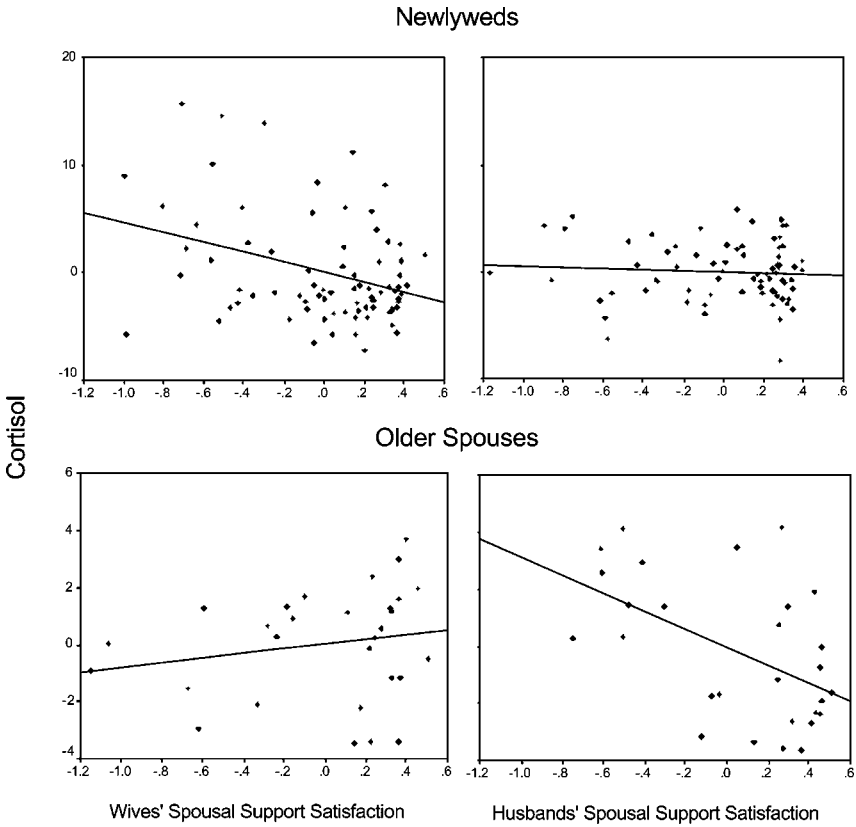

Fig. 1. Partial plots of spouses' cortisol responses across conflict as a function of spousal support satisfaction. Baseline cortisol values and marital satisfaction were partialled from these associations. $N = 170$ newlyweds (85 wives and 85 husbands) and $N = 60$ older spouses (30 wives and 30 husbands); df $= n - 3$ and ranged from 140 to 159 for newlyweds and 52 to 54 for older spouses due to missing data for some variables and removal of outliers for the analyses. Newlywed wives and older husbands who were more satisfied with spousal support had lower cortisol responses during conflict. Spousal support satisfaction did not relate to cortisol responses for newlywed husbands and older wives.

Older Adults' Cortisol Response During Conflict

Husbands' satisfaction with spouse support correlated significantly and negatively with cortisol response during conflict when controlling for baseline cortisol values ($pr = -0.59$, $p < 0.01$) and this association only declined slightly after controlling for marital satisfaction ($pr = -0.57$, $p < 0.01$). There were no significant relationships between wives' satisfaction with spousal support and cortisol response during conflict when controlling

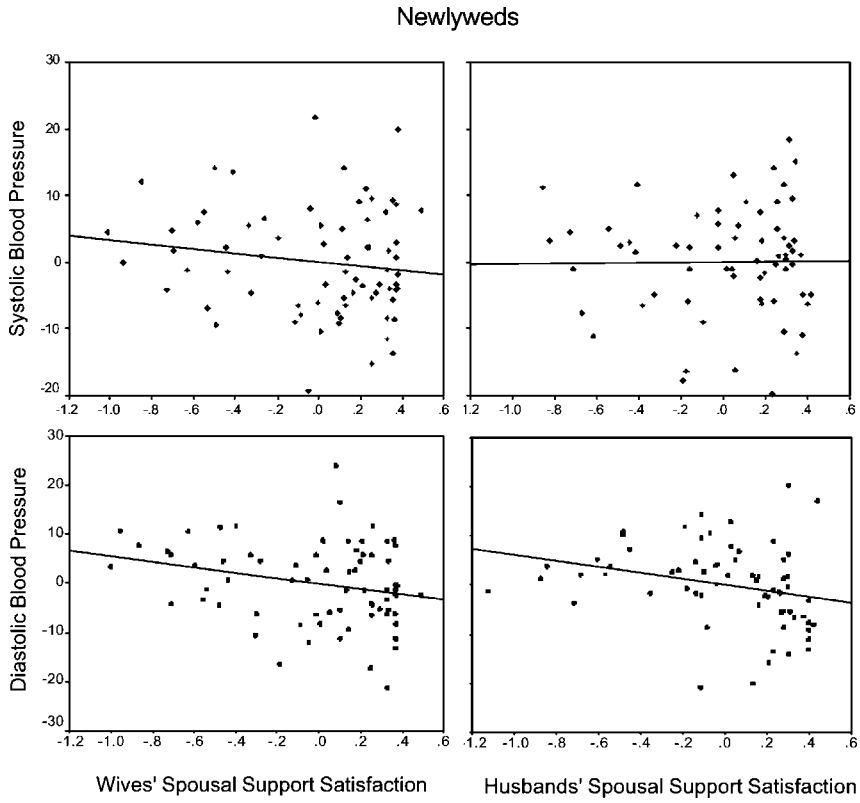

Fig. 2. Partial plots of newlyweds' blood pressure at the end of conflict as a function of spousal support satisfaction. $N = 170$ newlyweds (85 wives and 85 husbands); df $= n - 3$ and ranged from 142 to 156 due to missing data for some variables and removal of outliers for the analyses. Baseline blood pressure values and marital satisfaction were partialled from the analyses. The more satisfied newlywed wives were with their spousal support, the lower their diastolic blood pressure responses after conflict. Newlywed husbands' partial correlation between diastolic blood pressure after conflict and spousal support satisfaction was only moderately significant ($p < 0.1$). There were no associations between spousal support satisfaction and systolic blood pressure responses.

for baseline cortisol ($pr = 0.13$, ns) and, additionally, marital satisfaction ($pr = 0.10$, ns).

Older Adults' Spousal Support and Discussion Outcomes

Partial correlations between wives' and husbands' satisfaction with the conflict discussion outcomes and spousal support indicated that, when

controlling for marital satisfaction, husbands' spousal support satisfaction was positively correlated with their satisfaction with the discussion outcomes (pr (27) = 0.48, $p < 0.01$); wives' satisfaction with discussion outcomes did not relate to spousal support satisfaction (pr (27) = 0.06, ns).

DISCUSSION

Newlywed wives who were less satisfied with the support they receive from their husbands had greater cortisol and affective responses to the conflict discussion, although affect associations with spousal support were completely mediated by marital satisfaction. Newlywed husbands' spousal support satisfaction did not relate to either affective or cortisol response. Among both wives and husbands, however, greater spousal support satisfaction buffered diastolic blood pressure to conflict, although for husbands, this association was mediated by marital satisfaction. Even when controlling for marital satisfaction, a powerful predictor of marital outcomes, the relationships between wives' spousal support and cortisol responses to conflict were maintained, a pattern that is notable in light of the overriding influence perceptions of relationship quality have on spouses' behaviors and judgments (Pasch *et al.*, 1997b).

These results might suggest that wives and husbands in new marriages may depend equally on satisfying spousal support for attenuating the stress of marital conflict. Indeed, both newlywed wives' and husbands' satisfaction with spousal support was significantly and positively related to marital satisfaction. However, wives' support satisfaction buffered physiological responses that derive from two different sources of autonomic influence: cortisol from the hypothalamic–pituitary–adrenal (HPA) axis and blood pressure from the sympathetic–adrenal–medullary (SAM) axis. Husbands' satisfaction buffered only blood pressure responses. Taken together, as predicted, wives' physiological responses to conflict were impacted by dissatisfaction with spousal support to a greater extent than husbands' responses.

For older husbands, we suggest that exclusive reliance on their wives for social support in older age (Antonucci and Akiyama, 1987) may entail costs during stressful marital interactions. Indeed, older husbands' spousal support satisfaction accounted for almost 35% of the variance in cortisol responses during marital conflict: older husbands who were less satisfied with the support they received from their wives had higher cortisol levels during conflict. However, as predicted, older wives' anger and cortisol responses did not significantly relate to spousal satisfaction and only reports of distress were moderately, but not significantly, associated with wives' spousal support satisfaction.

Consistent with related studies (Acitelli and Antonucci, 1994; Julien and Markman, 1991), greater marital satisfaction for older wives (but not older husbands) was related to increased satisfaction with spousal support. Additionally, older husbands' overall satisfaction with discussion outcomes was significantly and positively associated with spousal support satisfaction; wives did not demonstrate this relationship. These findings together suggest that older husbands and wives may define the constituents of spousal support differently, and thus may feel satisfied with their marriages for different reasons. Moreover, we assessed satisfaction with the emotional support provided by spouses using the SSQ (Sarason *et al.*, 1983; Wills and Shinar, 2000); others have noted that wives' well-being, which is greatly determined by marital satisfaction, is derived from the emotional qualities of marriage to a greater degree than husbands' (Gove *et al.*, 1983).

Why did the newlywed wives and husbands have parallel associations between spousal support and marital satisfaction when we expected, based on prior findings, that wives' spousal support would be more strongly positively correlated with marital satisfaction? One explanation relates to possible reciprocal effects of relationship satisfaction and support in marriage (Pasch *et al.*, 1997b). First, supportive exchanges between spouses may affect their marital satisfaction over time. In their social learning model of marriage, rewarding exchanges are posited to lead to increases in relationship satisfaction, whereas punishing behaviors will lead to declines in satisfaction. Conversely, the more satisfied spouses are with their marriage, the more likely they will approach one another in attempts to elicit support, and the more positively each will respond to these requests. As a result, every interaction between spouses is situated within their historical relationship context which cumulatively produces spouses' relationship satisfaction (Pasch *et al.*, 1997b). Thus, the stronger relationships between general well-being, marital satisfaction, and spousal support for wives likely emerge over time with an accumulation of experiences between spouses. Again, husbands may derive their marital satisfaction from other characteristics of the marriage as they age with their wives.

The biopsychosocial associations we observed shed light on the ways spousal support perceptions should relate differently to younger and older spouses' orientations to marital conflict. Social support in older age likely entails processes and factors that are distinct from those that encompass the social support experience at younger ages; social network members may move through life together in a "convoy" of social relations (Antonucci and Akiyama, 1994). Women are more likely than men to be engaged in caregiving for members of this convoy, including caring for their husbands, and are more likely than men to experience strain performing this care (Antonucci,

1994). These discrepant demands and consequences should differentially impact the need for support-seeking outside of a primary tie, such as that provided by marriage. As wives and husbands age and relative gender differences in social integration emerge, older husbands may become increasingly invested in their wives for support, and, consequently, more threatened by conflict with them. For these older husbands, positive spousal support perceptions appear to play an important role in attenuating this threat.

These relationships also provide a window into the potential mechanisms linking marriage and health outcomes. We assessed a physiological consequence of stress activation of the HPA axis and in newlyweds, we also examined outcomes of SAM axis activation. Blood pressure changes, a function of both the volume of blood output from the heart as well as constriction of the peripheral blood vessels, result from SAM activation. Heightened vasoconstriction from acute or chronic stress in the short-term is believed to be tied to poor cardiovascular health outcomes later (Saab and Schneiderman, 1993). HPA-derived cortisol is especially important for maintaining normal metabolic function but is also implicated in stress-related dysregulation of immune function (Lovallo, 1997). Indeed, higher levels and more positive perceptions of support relate to better immune function (Dixon *et al.*, 2001; Esterling *et al.*, 1994; Kiecolt-Glaser *et al.*, 1991).

Our younger and older couples were very satisfied with spousal support. Even in light of the restricted range of scores, self-reports of spousal support satisfaction related to the less consciously-controlled physiological responses for both younger and older adults. This suggests that small differences in spousal support perceptions can explain individual variation in physiological function during conflict with a spouse. However, it is unclear whether the changes we observed in cortisol and blood pressure have clinical significance for health in the long term. Future longitudinal studies should directly address the physiological mechanisms that over time produce associations among social support and health, especially in the context of marital relationships.

Further, the magnitude of these physiological changes was probably influenced by several factors, and many of these factors may additionally limit the generalizability of our findings beyond a very narrow demographic. Our subjects were quite healthy as a function of our stringent mental and physical health exclusion criteria. These couples were, on the average, very satisfied with their marriages; only 3% of our subjects actually scored below 100 on the MAT, the traditional cutoff for marital distress (Ewart *et al.*, 1991). Couples' fights at home are more negative and last longer than those studied in the laboratory (Margolin *et al.*, 1989). Our couples are much better educated and have higher incomes than the average family in the United States,

both factors that have been implicated in moderating responses to stressful events (Burman and Margolin, 1992), and our spouses were predominantly Caucasian. While our findings may be limited to similarly characterized couples, we believe our data are likely to underestimate the physiological impact of marital discord: marital conflict may produce even greater endocrine change in less fit populations, and perceptions of spousal support may be an even more powerful buffer for individuals facing socioeconomic constraints. Subsequent studies of spousal support, marital conflict and physiological concomitants should be conducted with diverse samples in order to clarify important modifying environmental and demographic factors.

Our data suggest that the pathways linking the shorter-term physiological processes to long-term health may well differ for wives and husbands across the life span. As husbands grow to rely exclusively on their wives, emotional spousal support, through its mediating effects on cortisol responses during marital conflict, may serve an important role in determining older husbands' health. For wives who maintain meaningful emotional relationships outside of marriage as they age (Carstensen and Charles, 1998), satisfaction with spousal support underpins more global perceptions of marital quality, setting the stage for positive marital functioning and subsequent pathways to health (Kiecolt-Glaser and Newton, 2001).

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