Journal of Behavioral Medicine, Vol. 24, No. 5, 2001

Cardiovascular Reactivity and Initiate/Avoid Patterns of Marital Communication: A Test of Gottman's Psychophysiologic Model of Marital Interaction

Wayne H. Denton,[1,3] Brant R. Burleson,[2] Barbara V. Hobbs,[1] Margaret Von Stein,[1] and Christopher P. Rodriguez[1]

Accepted for publication: April 28, 2001

Gottman's (1990, 1991; Gottman and Levenson, 1988) psychophysiologic model of marital interaction was tested in 60 married couples. Participants were classified as avoiders or initiators of relationship problem discussions by trained coders observing videotaped semistructured interviews. Blood pressure (BP) and heart rate reactivity was assessed during the cold pressor test, during a mental math test, while watching a marital argument on video, and during a conjoint interview. As hypothesized, avoiders had significantly greater systolic BP reactivity during the interview. Additionally, husbands who interacted with avoider wives had significantly greater diastolic and systolic BP reactivity than did husbands of initiator wives. Initiator husbands, in particular, who were married to avoider wives had greater systolic BP reactivity. These results both support Gottman's psychophysiologic model and suggest modifications of it.

KEY WORDS: cardiovascular reactivity; marital interaction; marital satisfaction.

INTRODUCTION

A growing body of evidence indicates that excessive cardiovascular reactivity to psychological stress may be a risk factor for the development of coronary artery disease and hypertension (e.g., Blascovich and Katkin, 1993;

[1]Department of Psychiatry & Behavioral Medicine, Wake Forest University School of Medicine, Medical Center Boulevard, Winston-Salem, North Carolina 27157.
[2]Department of Communication, Purdue University, West Lafayette, Indiana 47907.
[3]To whom correspondence should be addressed; e-mail: denton@wfubmc.edu.

0160-7715/01/1000-0401$19.50/0

Blascovich *et al.*, 1989; Hotz, 1995; Krantz and Manuck, 1984; Potempa, 1994). A recent review concluded that while "cardiovascular reactivity cannot yet be considered an established risk factor for either coronary heart disease or hypertension . . . the preponderance of existing clinical, experimental, and epidemiologic evidence is consistent with such an association and warrants further study" (Manuck, 1994, pp. 4–5). The hypothesis that cardiovascular reactivity may play a role in cardiac illness has received enough support that it is now presented in major textbooks of cardiology (e.g., Eliot *et al.*, 1998; Farmer and Gotto, 1997).

There is evidence for a gender difference in blood pressure reactivity. In particular, males have been found to have greater systolic blood pressure reactivity than females (e.g., Allen *et al.*, 1993; Lawler *et al.*, 1995; Light *et al.*, 1993; Murphy *et al.*, 1995). These recent results are consistent with an earlier meta-analysis which, likewise, concluded that males have greater systolic blood pressure reactivity (Stoney *et al.*, 1987). Less often, males have also been found to have greater diastolic blood pressure reactivity than females (Allen *et al.*, 1993; Murphy *et al.*, 1995).

Stoney and colleagues (1987) have proposed that gender differences in systolic blood pressure reactivity might partially explain gender differences in coronary artery disease. While coronary artery disease is the foremost cause of death for both genders in industrialized countries "at any given age . . . coronary mortality is much higher in men than in women" (Price and Fowkes, 1997, p. 584). Similarly, the age at onset of coronary artery disease is earlier in men than in women (Genest and Cohn, 1998).

Gottman (1990, 1991; Gottman and Levenson, 1988) has presented a psychophysiologic model of marital interaction that links gender differences in physiologic reactivity with gender differences in patterns of marital communication. Gender differences in how couples argue have been described as long as couples have been studied (reviewed by Gottman, 1994). Early interview studies found that husbands felt that their wives were too complaining, whereas wives felt that their husbands were too emotionally withdrawing (Komarovsky, 1962; Locke, 1951; Terman *et al.*, 1938). Later studies, utilizing observational methods, described the same patterning of marital communication (e.g., Raush *et al.*, 1974).

Clinical writers have recognized and discussed this same pattern in couples presenting for therapy. That is, that women try to engage in relationship problem discussions, while men try to avoid such discussions. This pattern has been referred to by a variety of synonymous terms including "engager-distancer" (Fogarty, 1976), "demand-withdraw" (Wile, 1981), and "pursue-distance" (Greenberg and Johnson, 1988). More recently, Christensen and his colleagues have empirically studied this demand-withdraw pattern of communication through a series of studies combining observational and

self-report methods. They have found that couples have a high level of agreement about the existence of demand-withdraw patterns and on their respective positions in the pattern (Christensen, 1987, 1988; Sullaway and Christensen, 1983). Confirming clinical experience, they have found that the wife-demand/husband-withdraw pattern tends to be more likely than that where the husband demands and the wife withdraws (Christensen and Heavey, 1990; Christensen and Shenk, 1991; Heavey *et al.*, 1993).

Supporting the validity of the demand/withdraw construct, couples in therapy exhibit more demand/withdraw communication than nondistressed couples but less than divorcing couples (Christensen and Shenk, 1991). Likewise, husband withdrawal from conflict is predictive of deterioration in marital satisfaction in longitudinal studies (Gottman and Krokoff, 1989; Gottman and Levenson, 1992; Heavey *et al.*, 1993, 1995), while the husband-demand/wife-withdraw pattern is associated with an increase in the wife's marital satisfaction 1 year later (Heavey *et al.*, 1993).

Drawing from studies on the psychophysiology of marital interaction (Levenson and Gottman, 1983, 1985), Gottman (1990, 1991; Gottman and Levenson, 1988) proposed a model of marital interaction linking the seemingly diverse findings of men exhibiting greater blood pressure reactivity to stressful events, more withdrawal from marital communication, and a higher incidence of coronary artery disease at a given age than women. Gottman's model suggests that "men cannot function as well as women in the context of high negative affect . . . if conflict levels do reach high levels, men will withdraw from the interaction" (Gottman and Levenson, 1988, p. 188). Specifically, this psychophysiologic model proposes that during marital conflict "the husband becomes very physiologically aroused and stonewalls [i.e., will not interact] with his wife . . . then, finally, emotionally withdraws from the conflict. . . . The husband's stonewalling is very aversive for the wife and leads to her physiological arousal. She responds by trying to re-engage her husband" (Gottman, 1991, p. 5). Thus, the model suggests that because of higher levels of cardiovascular reactivity, men try to avoid emotionally arousing relationship discussions. In support of this model, there is evidence that individuals can have awareness of aversive sensations associated with increases in blood pressure (Pennebaker, 1982). Gottman (1994, p. 107) has speculated that sustained high levels of physiologic arousal from ongoing patterns of marital interaction might eventually lead to poor health outcomes.

Empirical findings bearing directly on the validity of Gottman's model are sparse; however, there have been some studies examining cardiovascular reactivity during marital interaction. For example, husbands with high levels of cynical hostility have been found to have greater systolic blood pressure reactivity when attempting to influence their wives (Smith and Brown, 1991).

In the same study, greater systolic blood pressure reactivity in wives was associated with husbands' cynical hostility (Smith and Brown, 1991). Frankish and Linden (1996) found that Type A men married to highly educated women had greater diastolic blood pressure reactivity than did Type A men married to lesser-educated women or Type B men married to women of either high or low education. Finally, increases in blood pressure for hypertensive women were associated with hostile interactions during a marital discussion, while for hypertensive men increases in blood pressure were associated with their own higher rate of speech during the discussion (Ewart *et al.*, 1991).

Although these studies have made contributions to the understanding of the relationship between marital interaction and physiological processes, they have not assessed engage-withdraw patterns of marital communication. The purpose of this study was to test Gottman's psychophysiologic model of marital interaction. Our own clinical observations were that, while the female engage-male withdraw pattern is most common in couples presenting for conjoint therapy, there is a substantial minority of couples in which the pattern is reversed. We speculated that the engage-withdraw pattern was related to differing levels of cardiovascular reactivity and that gender was merely a covariate of both levels of cardiovascular reactivity and the engage-withdraw pattern. The specific hypothesis of our study was that individuals (*be they male or female*) who avoid marital problem discussions would have greater levels of cardiovascular reactivity than individuals who initiate such discussions.

Our original goal was to assess general levels of cardiovascular reactivity in situations apart from the spouse and then test whether higher levels of general reactivity were associated with the tendency to avoid relationship discussions. As we were not sure what the optimal stressor would be for these assessments, three stressors were utilized to represent roughly three types of stress: (a) a physical stressor (the cold pressor test; CPT), (b) a mental stressor (mental math test), and (c) a social stressor (watching a videotape of a marital argument). As part of the study, participants were interviewed conjointly with their spouse; physiologic measurements were also taken during this interview. The conjoint interview thus constituted a fourth stressor situation.

METHOD

Participants

Participants were 60 married couples who were recruited from newspaper advertisements and referrals from clinicians. There were no exclusionary

criteria, as their is some evidence that cardiovascular reactivity is not affected by antihypertensive medications (Delamater *et al.*, 1989). Participants were paid $40 per couple for their participation. Age of participants ranged from 23 to 71, with a mean age of 39. The mean number of marriages was 1.3, with a range of 1 to 6. The average couple had been married 12 years with a range of less than 1 to 47 years. Couples averaged 1.2 children living in the home, with a range of 0 to 4. All but 3 of the participants had at least a high school education and 97 had some education beyond high school. The average participant indicated that their yearly family income was between $40,000 and $49,999. In two couples, both members were African-American. There was one native Asian member of one couple and the remainder of the participants were Caucasian.

Apparatus and Materials

Physiological Assessments. Blood pressure and heart rate were measured with a Dinamap automated, oscillometric blood pressure monitor (Model 8100; Critikon Inc., Tampa, FL).

Dyadic Adjustment Scale (DAS). The DAS is a 32-item self-report inventory. It is one of the most widely used instruments for the assessment of marital adjustment. Reliability for the entire scale has been found to be 0.96 (Spanier, 1976). Validity has been demonstrated by its ability to discriminate married from divorced couples and its high correlation with other measures of marital adjustment (Spanier and Filsinger, 1983).

Positive Feelings Questionnaire (PFQ). The PFQ was designed to assess the amount of positive affect toward a spouse (O'Leary *et al.*, 1983). It is a 17-item self-response inventory, with responses made on a 7-point scale. All 17 items discriminated between clinic and nonclinic couples and the PFQ was also internally consistent ($r = .94$) (O'Leary *et al.*, 1983). The PFQ has been found to be responsive to changes occurring from marital therapy (O'Leary and Arias, 1983; Turkewitz and O'Leary, 1981).

Beck Depression Inventory (BDI). The BDI is a commonly used self-report measure of depression (Beck *et al.*, 1961). It contains 21 items assessing different aspects of depression. For each item, respondents choose one of four response options that best represent how they felt in the last week.

Procedure

Questionnaires and Baseline Measurements. Participant couples came jointly to a one-time assessment session. They were instructed to abstain from caffeine and alcohol for 8 hr and from tobacco for 1 hr prior to the

assessment session. After obtaining informed consent they were separated and completed the questionnaires. Each participant then had an appropriate-size blood pressure cuff applied from the Dinamap to obtain baseline measurements. Participants were asked to relax and to try and minimize all movement while baseline physiological measures were taken. Blood pressure and heart rate were measured by the Dinamap every 60 sec. The baseline phase was ended when a stable baseline was obtained which was defined as three consecutive systolic blood pressure measures within 5 mm Hg, excluding the first reading.

Cold Pressor Test. The protocol for the cold pressor test was adapted from Lash *et al.* (1991). Participants heard an audiorecording of the following instructions: "We want to know how long you are able to keep your hand in the ice water. Use your willpower to resist the temptation to pull your hand out for as long as you absolutely can. Try as hard as you can. Individuals in good physical condition do better at this. Good performance also reflects perseverance. We will be recording how long you are able to keep your hand in the water and your physiological responses." Participants were then instructed to place their hands in a container of ice water to a point 1 in. above the wrist. Blood pressure and heart rate were assessed once participants' hands had been in the water for 45 sec. After 75 sec all participants were asked to remove their hand, if they had not already done so. Blood pressure and heart rate assessments were taken at 60, 120, 180, and 240 sec after the initial measurement.

Mental Arithmetic. Participants were next asked repeatedly to subtract seven from the number "2018" for 5 min. They were asked to work as quickly and as accurately as possible and were told that the research assistant would be marking down their answers to assess their accuracy. Blood pressure and heart rate assessments were taken once each minute, for a total of five assessments.

Video Stressor. Next, each participant was shown a 5-min segment from the documentary "Couples Arguing" (View Film & Video, Inc., 1985) and asked to imagine how they would respond in this situation. The segment showed a couple having an impassioned argument in their home. Blood pressure and heart rate were measured every 60 sec for 5 min during the showing of the video.

Conjoint Interview. Participant couples were then reunited in an interview room for the Communication Patterns Interview (CPI). They continued to have a blood pressure cuff applied to their arm. The CPI is a semistructured interview developed for this study to determine the pattern of interaction between spouses in a dyad. It is derived from the clinical practice of tracking the cycle of interaction between couples in marital therapy (e.g., Johnson, 1996). The CPI was designed to be used, however, with any couple

regardless of whether they reported having any relationship problems. The CPI was videotaped and physiologic measurements were taken every 60 sec during the interview that lasted 10 to 20 min. Interviews were conducted by one of two therapists, who received training in conducting the CPI from the first author.

The protocol for the CPI was that, with the couple seated together, the interview began with the statement from the interviewer that

> every couple occasionally has things come up that they don't exactly agree on or see eye to eye on or maybe one person does something that the other person doesn't like—maybe its a big thing or it could be a small thing—and every couple has a different way of handling these disagreements—maybe they try to resolve them or maybe they just ignore them and decide they will live with it or maybe they try to resolve them and they find that they can't. What I would like to get a picture of during this discussion is how the two of you handle these situations. I know that you might handle different situations differently but most couples have a "usual" or "most common" way of handling differences. What I am most interested in is the *usual* way you would handle one of these situations. If I was a fly on the wall of your home and watched you all for a while, what would I usually see happen when there was an area of difference or disagreement?

From this point on in the interview, different questions were used depending on the responses. For example, if they were unclear what was being asked additional questions to clarify would include "Would either of you bring this issue up or not?" If they responded "no" (i.e., neither of them would bring it up) the interviewer would ask: "How do you handle it if the other does something you don't like or that you disagree with?" If they agreed that neither of them tended to initiate discussions, the interview was terminated.

If they answered that at least one of them would bring up the issue, the interviewer would ask questions such as "Would one of you be more likely to bring this area up?" "What would you say?" and "What would your (i.e., the other spouse) response be?"

During this part of the interview, the interviewer would check back and forth between the two participants to see if they agreed with each other on who initiated. For example, the interviewer would ask, "Does that sound like something s/he would say/do?" If they responded "no," the interviewer would reconcile the accounts. Questions such as "What do you think s/he would say?" and "Does that sound familiar [to the first speaker]?" would be asked until agreement was reached that one or both of them would usually initiate a relationship issue discussion. The focus in the CPI was on the initiation (or lack thereof) of a problem discussion. Unlike a clinical interview, it was not necessary to track the rest of the discussion cycle to its conclusion.

The CPI videotapes were coded by two coders who were graduate students in marriage and family therapy. They had no information about the

participants other than what could be observed on the CPI videotapes. Specifically, they could not observe the Dinamap readings during the interviews. A coding manual was developed for coding the videotapes and the raters were told they would be asked to label each individual participant as either an initiator or avoider. The coders were given didactic instruction in the concepts to be assessed and the principal investigator showed and discussed videotapes of sample CPIs for further instruction in the assignment of the diagnoses. Coding was based on what the participants self-reported about their handling of differences. Actual behavior during the interview was not coded. At the conclusion of the training process, the coders each coded 20% of the sample (12 videotapes) and had perfect agreement on labeling each participant as an avoider or an initiator. This variable is referred to as "initiate status" since the coding was based on whether they *initiated* problem discussions and not whether they engaged in them if their partner brought the matter up for discussion. The remaining 48 videotapes were then divided between them for coding. Due to technical difficulties, two of the videotapes could not be coded which left 58 couples or 116 individuals in the sample.[4]

RESULTS

Initiate-Avoid Assessments

The coders identified 46 avoiders and 70 initiators in the sample. Of the avoiders, 67% (31) were male and 33% (15) were female. For initiators, the distribution by gender was nearly the reverse of that for avoiders: 39% (27) were male and 61% (43) were female. A chi-square test indicated that initiate/avoid status varied significantly as a function of gender [$\chi^2(1, N = 116) = 9.22$, $p < .002$]. There were 7 avoid-avoid couples, 21 initiate-initiate couples, 23 female initiate-male avoid couples, and 7 male initiate-female avoid couples. This distribution of couple types is similar to that reported by other researchers who have used other assessment procedures (e.g., Christensen and Shenk, 1991).

There were no significant differences between initiators and avoiders in terms of age, income, highest level of education, years married, or number of children. In addition, avoiders and initiators did not differ significantly on the DAS, PFQ, or BDI.

We conducted a series of ANOVAs to assess whether there were any effects of gender or husband status by wife status on the background variables.

[4]The tasks were completed in a fixed order, which could be a cause for some concern. However, since there was no relationship of initiator status to any task other than the conjoint discussion, it seems very unlikely that task order would have played a significant role in the results.

We found that there were no effects due to initiator status (own or spouse) or the interaction between gender and initiator status on any of the background variables [age, education, income, years married, depression (BDI), satisfaction (DAS), or liking for spouse (PFQ)]. Additionally, there were no main effects for gender on any of the background variables except for depression [$F(1,112) = 6.31$, $p < .02$], with men being less depressed (M = 6.38) than women (M = 9.19). Mean depression ratings for both men and women fall within the nondepressed range on the BDI (Beck *et al.*, 1961).

Preliminary Analyses

The overall design for the study was a mixed-model, doubly multivariate $2 \times 2 \times 5$ MANOVA. The between-groups factors were initiation status (avoid vs. initiate) and gender (male vs. female). The within-subjects factor was arousal level at the five times at which physiological states were assessed (baseline, cold pressor test, mental arithmetic, video argument, and Communication Patterns Interview). There were three dependent variables: heart rate, diastolic blood pressure, and systolic blood pressure. Baseline measures on the dependent variables served as a reference category. Reactivity to each stressor was assessed by (a) computing an average value for each physiological measure for the readings taken during each of the four stressors and (b) then contrasting these average arousal levels during each stressor with the baseline arousal level. Analyses for outliers in the physiologic data found virtually no difference in means for trimmed and untrimmed distributions on all three measures. Hence, no data were excluded from subsequent analyses. The General Linear Model module in SPSS for Windows (version 7.5) was used in conducting analyses.

Single-degree of freedom multivariate contrasts were used to evaluate the effects of initiation status and gender on physiological reactivity to the stressors. Each contrast reflected a mixed-model, doubly multivariate $2 \times 2 \times 2$ design. The between-groups factors were initiation status (avoid vs. initiate) and gender (male vs. female). The within-subjects factor was time of physiological assessment (baseline assessment vs. average recorded level for the stressor). Thus, each contrast evaluated the significance of the difference between the baseline reading and the average reading recorded for each of the three physiological assessments on each of the four stressors (i.e., degree of elevation above baseline), as well as the extent to which the differences between baseline and average levels during the stressors were qualified by the factors of initiation status and gender.

These tests detected highly significant main effects for the contrasts between baseline and average readings on all three of the physiological

measures for each of the four stressors. For every physiological assessment, the average reading during each of the four stress tests was significantly higher than the baseline readings. In effect, these results amount to a manipulation check, demonstrating that each of the stress tests provoked an aroused state in participants.

To obtain a sense of the relative arousal generated by each task, η^2 coefficients for the contrasts between baseline and mean levels during the stressors were averaged over the three physiological measures for each task. The following average eta-square values were observed: cold pressor average, $\eta^2 = .23$; mental arithmetic average, $\eta^2 = .39$; videotaped argument average, $\eta^2 = .06$; and conjoint discussion average, $\eta^2 = .23$. Thus, three of the four stressors proved to be equally and moderately arousing. The videotaped argument proved to be a much less arousing stressor, though it still resulted in significant elevations above baseline on all physiological assessments.

The major interest of the study was in whether participants were differentially reactive to the stressors, especially whether avoiders were more reactive to the stressors than initiators. No significant effects due to initiation status or gender were observed for the cold pressor, math problem, or video argument stressors. However, several interesting effects were observed for the conjoint discussion stressor which are reported below.

Effects of Initiation Status and Gender on Physiological Reactivity During Conjoint Discussion Stressor

A significant initiation status $\times$ time interaction was observed for systolic blood pressure on the conjoint discussion task [$F(1,111) = 3.76$, $p = .05$]. Decomposition of this interaction (means for which are presented in Table I) indicated that, as predicted, avoiders were more reactive than initiators (mean elevations above baseline = 5.89 and 4.53, respectively).

Significant interactions involving gender were observed for multiple dependent variables; means for these interactions are displayed in Table II. There was a significant gender $\times$ time interaction for diastolic blood pressure

Table I. Means and Standard Deviations for Systolic Blood Pressure During the Conjoint Discussion Task

	Avoiders	Initiators
Baseline	126.84	122.06
Reading	(16.07)	(12.31)
Average reading	132.73	126.59
During discussion	(14.48)	(12.51)

Note. Coefficients in parentheses are standard deviations.

Table II. Means and Standard Deviations for Diastolic and Systolic Blood Pressure During the Conjoint Discussion Task

	Males	Females
Diastolic pressure		
Baseline	72.24	64.42
Reading	(10.21)	(9.13)
Discussion	74.63	69.02
Reading	(9.78)	(10.42)
Systolic pressure		
Baseline	128.71	119.07
Reading	(13.57)	(12.88)
Discussion	131.98	125.97
Reading	(13.39)	(13.23)

Note. Coefficients in parentheses are standard deviations.

[$F(1,111) = 4.81$, $p < .03$]. Males were less reactive on this measure during conjoint discussions than were females (mean elevations above baseline = 2.39 and 4.61 for males and females, respectively). There was also a significant gender × time interaction for systolic blood pressure [$F(1,111) = 9.95$, $p < .002$]. Once more, males were less reactive on this measure than were females (mean elevations above baseline = 3.27 and 6.90 for males and females, respectively). The three-way interaction among initiation status, gender, and time was not significant for any of the dependent variables.

In the conjoint discussion participants interacted with their spouse, a circumstance raising the possibility that their stress responses were affected not only by their own initiation status, but also by the initiation status of their spouse. To examine this possibility we undertook a series of analyses assessing the joint effects of own and spouse's initiation status on physiological reactivity during the conjoint discussion. Prior to undertaking these analyses, we examined, for each of the three physiological measures, correlations between spouses' (a) baseline levels of arousal, (b) average levels of arousal during the conjoint discussion, and (c) reactivity levels (i.e., elevations above baseline) during the conjoint discussion. This was to determine whether there were statistical dependencies in spouses' levels of physiological arousal both at baseline and during the discussion, as well as in elevation (reactivity). These correlational analyses found no significant associations between spouses' physiological indicators at baseline or during the conjoint interaction (see Table III). Nor were their any significant associations for spouses' reactivity levels (elevations above baseline) for any of the three physiologic measures. Indeed, all correlations between spouses' physiological arousal levels were quite low.

Since couples' physiological states were uncorrelated, the individual remained the unit of analysis. To assess the effects of own and spouse's initiation

Table III. Correlations Between Spouses' Physiological Assessments at Baseline and During the Conjoint Discussion

	Correlation		
Physiological assessment	At baseline	During conjoint discussion	For reactivity
Diastolic pressure	.19	.16	−.04
Systolic pressure	.00	−.04	.03
Heart rate	.02	.07	.00

Note. $N = 58$ couples. None of the correlations are statistically significant.

status on physiological reactivity during the conjoint discussion, a separate $2 \times 2 \times 2$ mixed-model MANOVA was carried out for each gender on the three physiological assessments. The between-groups factors were own initiation status (avoider vs. initiator) and spouse's initiation status (avoider vs. initiator), while the within-subjects factor was the time at which the physiological assessments were obtained (baseline vs. average reading during the conjoint discussion). Single-degree of freedom contrasts were used to assess whether differences in physiological reactivity (i.e., elevations above baseline) differed significantly as a function of the initiation status of self and spouse.

The analysis for wives detected no significant effects for the initiation status of their husband, or for the interaction of the wife's own initiation status with that of her spouse, on reactivity for any of the three physiological measures. Only an effect on systolic blood pressure for the wife's own initiation status was detected [$F(1,54) = 4.51$, $p < .05$]. Consistent with results observed for the entire sample, avoider wives exhibited greater reactivity during the conjoint discussion than did initiator wives (10.78 and 5.54 above baseline for avoiders and initiators, respectively; see Table IV).

The analysis for husbands detected several significant differences in reactivity attributable to initiation status. Specifically, there was a significant own initiation status × time interaction for heart rate [$F(1,54) = 4.68$, $p < .05$]. Husband initiators exhibited greater reactivity in terms of heart rate

Table IV. Means and Standard Deviations for Wives' Systolic Blood Pressure During the Conjoint Discussion

	Wife initiate status	
Systolic blood pressure	Avoider	Initiator
Baseline	119.73	119.58
Reading	(18.29)	(11.56)
Discussion	130.51	125.12
Reading	(15.64)	(12.96)

Note. Coefficients in parentheses are standard deviations.

Table V. Means and Standard Deviations for Husbands' Heart Rate During the Conjoint Discussion

	Husband initiate status	
Heart rate (pulse)	Avoider	Initiator
Baseline	69.45	64.93
Reading	(12.99)	(9.76)
Discussion	69.67	67.37
Reading	(11.06)	(9.41)

Note. Coefficients in parentheses are standard deviations.

(average elevation = 2.44) than did avoider husbands (average elevation = 0.22; see Table V). Next, there was a significant spouse initiation status × time interaction for diastolic blood pressure [$F(1,54) = 5.08, p < .03$]. As the means in Table VI show, husbands who interacted with wives classified as avoiders exhibited significantly greater reactivity than did husbands who interacted with wives classified as initiators (mean elevations above baseline = 5.37 and 1.35 for husbands interacting with avoiders and initiators, respectively). There was also a significant spouse initiation status × time interaction for systolic blood pressure [$F(1,54) = 4.32, p < .05$]. Once more, husbands who interacted with wives classified as avoiders exhibited significantly greater reactivity than did husbands who interacted with wives classified as initiators (mean elevations above baseline = 6.19 and 2.25 for husbands interacting with avoiders and initiators, respectively; see Table VI).

Importantly, there was a significant three-way interaction among husband's initiation status, wife's initiation status, and time on the husband's systolic blood pressure [$F(1,54) = 4.44, p < .05$]. The means for this interaction

Table VI. Means and Standard Deviations for Husbands' Diastolic and Systolic Blood Pressure During the Conjoint Discussion Task as a Function of Wives' Initiate Status

	Wife initiate status	
Husband blood pressure	Avoider	Initiator
Diastolic pressure		
Baseline	71.33	72.56
Reading	(11.24)	(9.95)
Discussion	76.70	73.91
Reading	(12.49)	(8.71)
Systolic pressure		
Baseline	128.80	128.67
Reading	(16.48)	(12.63)
Discussion	134.99	130.92
Reading	(17.41)	(11.74)

Note. Coefficients in parentheses are standard deviations.

Table VII. Means and Standard Deviations for Husbands' Systolic Pressure During the Conjoint Discussion Task as a Function of Own and Spouses' Initiate Status

	Avoider husband		Initiator husband	
Systolic pressure	Avoider wife	Initiator wife	Avoider wife	Initiator wife
Baseline	133.89	129.91	121.17	127.38
Reading	(18.29)	(12.31)	(10.42)	(13.13)
Discussion	137.40	133.49	131.38	128.24
Reading	(20.31)	(11.66)	(12.74)	(11.49)

Note. Coefficients in parentheses are standard deviations.

are presented in Table VII. Decomposition of this interaction revealed that the initiation status of the wife had a very small and nonsignificant effect on the reactivity of avoider husbands (mean elevations above baseline = 3.51 and 3.58 for avoider husbands interacting with avoider and initiator wives, respectively). In contrast, initiation status of the wife exerted a strong effect on the physiological reactivity exhibited by initiator husbands, with these husbands showing much stronger reactions to avoider wives (mean elevation above baseline = 10.21) than to initiator wives (mean elevation above baseline = 0.86). [A similar three-way interaction for diastolic pressure approached significance [$F(1,54) = 2.74, p = .10$]. In sum, these results indicate that husbands find it more stressful (or arousing) to interact with wives who are avoiders than wives who are initiators, and this is especially true for husbands who are themselves initiators.

DISCUSSION

The results of the current study provide some support for predictions derived from Gottman's (1990, 1991) psychophysiologic model of marital interaction. These results, however, also qualify this model in important ways.

Replicating the findings of previous studies (e.g., Heavey *et al.*, 1993), we found pronounced gender differences in initiator status. Two-thirds of the avoiders were male, whereas more than 60% of the initiators were female. The partners in about half of the couples in this study (28 of 58 or 48%) exhibited the same initiator status; in seven couples both partners were classified as avoiders, and in 21 couples both partners were classified as initiators. However, when partners exhibited a different initiator status, there were more than three times the number of female initiate-male avoid couples ($n = 23$) than there were male initiate-female avoid couples ($n = 7$). Similar patterns of gender-related couple differences have been reported by other researchers (e.g., Christensen and Heavey, 1990; Christensen and Shenk, 1991).

Some have sought to explain the gender-related differences in initiator status in terms of the differential socialization of men and women. For example, Rubin (1983) suggests that women are more likely to engage in conflict with their spouses because they have been socialized to take care of relationships (see also Klein and Johnson, 1997). However, Gottman's (1990, 1991) psychophysiological model of marital interaction suggests a quite different source for gender differences in initiator status. Gottman's model suggests that men have more physiological arousal (which is experienced as aversive) during conflict interactions than women. Hence, men should be more likely than women to avoid such interactions. The differential distributions observed in this study of men and women in avoider and initiator categories are consistent with this aspect of Gottman's model.

Gottman's model assumes that men are more physiologically reactive than women. There is evidence consistent with this view, with men having been found to exhibit greater reactivity than women with respect to both systolic blood pressure (e.g., Lawler *et al.*, 1995) and diastolic blood pressure (e.g., Murphy *et al.*, 1995). However, in the current study, we found that men exhibited significantly *lower* levels of systolic and diastolic reactivity than did women. This finding appears inconsistent with Gottman's model. Interpretation of the gender differences in reactivity detected in the current study is complicated by the findings of supplemental analyses indicating that men had significantly higher baseline systolic readings than women [M = 128.71 and 119.07 for men and women, respectively; $F(1,112) = 10.36$, $p < .01$], as well as significantly higher diastolic readings [M = 72.24 and 64.42 for men and women, respectively; $F(1,112) = 12.39$, $p < .001$]. The greater reactivity exhibited by women in the current study may, then, stem from the fact that they were less aroused than men at baseline and, thus, could exhibit greater reactivity to arousing stimuli. In any event, the current data are silent on the question of whether men *experience* physiological arousal as more aversive than do women. Future research should obtain self-reports from participants concerning the pleasantness or unpleasantness of the arousal levels they experience (see Pennebaker, 1982).

The results of the current study do provide support for Gottman's psychophysiological model in one very important respect: as predicted, when interacting with their spouses, avoiders exhibited significantly greater reactivity with respect to systolic blood pressure than did initiators. Presumably, avoiders experience the physiological arousal associated with confrontative spousal interaction as aversive, and that is why they seek to avoid such interactions (Gottman, 1990, 1991).

Although the significant main effect for initiator status on systolic pressure provides support for Gottman's psychophysiological model, other results obtained in this study indicate that arousal (physiological reactivity)

is not simply a matter of gender or one's own initiator status. Indeed, we found that, in some instances, reactivity was a complex function of gender, own initiator status, and spouse's initiator status. Specifically, we found that husbands who interacted with avoider wives evidenced significantly greater reactivity than husbands who interacted with initiator wives, and this was especially true for husbands who were themselves classified as initiators. Interestingly, then, not only were avoider wives more reactive themselves in the context of confrontative discussions with their husbands, but also these wives also provoked greater reactivity from their husbands, especially when their husbands were initiators. It appears that initiator men become particularly aroused when their wives seek to avoid a confrontation they wish to pursue. The results observed here resemble those previously reported for men with high levels of cynical hostility. For example, in couples where the husband has high levels of cynical hostility, both husbands and wives have greater systolic blood pressure reactivity when the husbands are trying to influence their wives (Smith and Brown, 1991). Unfortunately, levels of cynical hostility were not assessed in the present study to allow more complete comparison to the results of Smith and Brown (1991). Such an assessment would be important in future studies of the psychophysiologic model. In addition, the small number of couples (seven) with the male initiate-female avoid pattern make any conclusions drawn from these results very tentative.

These results suggest that "gender" may be less important in the psychophysiologic model than the underlying tendency toward cardiovascular reactivity and the interactive effects between spouses. We did not find the specific connections among gender, physiological reactivity, and interactional behavior predicted by the original model (where physiological arousal is held to be more aversive for men so they tend to avoid confrontative interactions with their spouses). Instead, our results suggest that physiological reactivity during confrontative interactions is a complex, joint function of one's own dispositions as well as the dispositions of one's spouse. *Either* husbands or wives may be initiators with respect to confrontative interactions, and *either* may act as avoiders with respect to such interactions. Consistent with this view, some recent research suggests that initiate-avoid status in confrontative interactions has less to do with gender than it does with *whose issue* is being discussed (Klinetob and Smith, 1996; see also Christensen and Heavy, 1990).

Moreover, degree of physiological reactivity during the course of confrontative interactions may be a function of one's own initiator status, the spouse's status, or some combination of own and spouse's status (e.g., while initiators generally get less aroused than avoiders during confrontations, initiator husbands may get more aroused than avoider husbands when

interacting with avoider wives). This is consistent with the proposition in the psychophysiologic model that initiators will become physiologically aroused in the face of withdrawal by their partner. It is also consistent with interactional and systems approaches to marital interaction which underscore that both personal and couple outcomes are jointly determined by the qualities of both spouses.

Our original assumption was that general measures of cardiovascular reactivity would be associated with patterns of couple communication. That is, for example, that avoiders would be consistently more reactive to a diverse array of stressors. Instead, we found that the most interesting differences between avoiders and initiators were manifest for only one of the stressors: the conjoint discussion. There was no evidence in our sample that either avoiders or initiators were generally more reactive to a broad spectrum of stressors. Thus, it appears that the cardiovascular reactivity was contextual to the conjoint situation only among the four stressors. In retrospect, this is not surprising as cardiovascular responses to interpersonal stressors do not appear to be highly correlated with responses to noninterpersonal stressors (Lassner *et al.*, 1994; Matthews *et al.*, 1986; Smith and O'Keefe, 1988). Additionally, cardiovascular reactivity during an interpersonal interview has been found to be a better predictor of ambulatory blood pressure than reactivity during noninterpersonal stressors (Ewart and Kolodner, 1993). Finally, to the extent that cardiovascular reactivity is an individual trait, it may be more reliably assessed when a number of cardiovascular responses are combined over a variety of laboratory tasks (e.g, Kamarck *et al.*, 1992, 1994).

Initially, a central interest of this study was with the three individual stressors used when the participants were isolated from their spouses. We, therefore, did not design the conjoint interview with the intention of it creating a high level of stress. These interviews were actually relatively nonstressful in comparison to typical marital communication research paradigms, as the interviews were directed by the interviewer and the participants talked primarily only with the interviewer rather than with each other. In contrast, common paradigms for studying marital interaction leave couples alone to try and resolve a problem they have identified on a problem checklist (e.g., Denton *et al.*, 1995; Gottman, 1979) or to try and influence each other (e.g., Brown and Smith, 1992). The relatively mild conjoint interview utilized here might have resulted in an underestimation of the differences between avoiders and initiators.

Some additional limitations of this study should be noted. One was that the design did not allow us to control the speaking time of the participants. This could be relevant since the amount of time speaking could be related to arousal levels. Future studies should attempt to control for

or keep constant speaking times. Another limitation was that we did not control for presence of medications or disease states. Although there is some evidence that medications do not have an impact on cardiovascular reactivity (Delamater *et al.*, 1989), other evidence indicates that disease and medication use can impact cardiovascular reactivity (Jennings *et al.*, 1997). Hopefully, the relatively young age of participants in this study minimized any such effects on the results. Future studies, however, should also attempt to control for medication usage and cardiovascular illnesses such as hypertension.

A crucial question that this study cannot answer is whether marital interaction has a relationship with health outcomes. While there is a substantial epidemiologic literature linking marital status with mortality and, to a lesser extent, morbidity (Campbell, 1986), the mechanism of these relationships is unknown. There has been a variety of explanations including that married people participate less in risky behaviors, have better emotional health, and have more favorable economic circumstances (Ross *et al.*, 1990). There has been almost no research, however, on actual marital interaction and health (Burman and Margolin, 1992). Future studies could compare, for example, persons with cardiac illness to a control group without such illness to determine if hypothesized patterns of marital communication are more common among those with the medical condition. Eventually, of course, the optimal test would be to follow couples of differing communication patterns longitudinally and monitor the development of illnesses (such as coronary artery disease) which might be related to cardiovascular reactivity. In addition, it should be noted there are other gender related variables that can contribute to health outcomes. For example, unique risk factors for cardiovascular disease in women include menopause, oral contraceptive use, and noncontraceptive use of estrogen (Howes, 1998).

Ewart and colleagues have provided evidence that marital communication training has positive short-term effects on blood pressure (Ewart *et al.*, 1984). The ultimate question in this line of research will be whether changing patterns of marital interaction aids in preventing or ameliorating illness. Our results suggest that the psychophysiologic model of marital interaction may be a useful guide in conducting such studies.

ACKNOWLEDGMENTS

This study was supported by National Institute of Mental Health Grant R24-MH51552. Appreciation is expressed to Mary McKinney and Jon Milliken for the videotape coding and David Jarrett for suggestions on the analysis.

REFERENCES

Allen, M. T., Stoney, C. M., Owens, J. F., and Matthews, K. A. (1993). Hemodynamic adjustments to laboratory stress: The influence of gender and personality. *Psychosom. Med.* 55: 505–517.

Beck, A. T., Ward, C. H., Mendelson, M., Mock, J., and Erlbaugh, J. (1961). An inventory for measuring depression. *Arch. Gen. Psychiatry* 4: 561–571.

Blascovich, J., and Katkin, E. S. (1993). Cardiovascular reactivity to psychological stress and disease: Conclusions. In Blascovich J., and Katkin, E. S. (eds.), *Cardiovascular Reactivity to Psychological Stress and Disease*, American Psychological Association, Washington, DC.

Blascovich, J., Schiffert, J. H., and Katkin, E. H. (1989). A comparison of exercise and psychophysiological stress testing for coronary disease [Abstract]. *Psychophysiology* 26: 57.

Brown, P. C., and Smith, T. W. (1992). Social influence, marriage, and the heart: Cardiovascular consequences of interpersonal control in husbands and wives. *Health Psychol.* 11: 88–96.

Burman, B., and Margolin, G. (1992). Analysis of the association between marital relationships and health problems: An interactional perspective. *Psychol. Bull.* 112: 39–63.

Campbell, T. L. (1986). Family's impact on health: A critical review. *Family Syst. Med.* 4: 135–328.

Christensen, A. (1987). Detection of conflict patterns in couples. In Hahlweg, K., and Goldstein, M. J. (eds.), *Understanding Major Mental Disorder: The Contribution of Family Interaction Research*, Family Process Press, New York, pp. 250–265.

Christensen, A. (1988). Dysfunctional interaction patterns in couples. In Noller, P., and Fitzpatrick, M. (eds.), *Perspectives on Marital Interaction*, Multilingual Matters, Clevedon, UK, pp. 31–52.

Christensen, A., and Heavey, C. L. (1990). Gender and social structure in the demand/withdraw pattern of marital conflict. *J. Person. Soc. Psychol.* 59: 73–81.

Christensen, A., and Shenk, J. L. (1991). Communication, conflict, and psychological distance in nondistressed, clinic, and divorcing couples. *J. Consult. Clin. Psychol.* 59: 458–463.

Delamater, A. M., Taylor, C. B., Schneider, J., Allen, R., Chesney, M., and Agras, W. S. (1989). Interpersonal behavior and cardiovascular reactivity in pharmacologically-treated hypertensives. *J. Psychosom. Res.* 33: 335–345.

Denton, W. H., Burleson, B. R., and Sprenkle, D. H. (1995). Association of interpersonal cognitive complexity and communication in marriage: Moderating effects of marital distress. *Family Process* 34: 101–111.

Eliot, R. S., Kumar, N., and Morales-Ballejo, H. M. (1998). The heart, emotional stress, and psychiatric disorders. In Alexander, R. W., Schlant, R. C., and Fuster, V. (eds.), *Hurst's: The Heart, Arteries, and Veins*, 9th ed., Vol. 2, McGraw–Hill, New York, pp. 2347–2356.

Ewart, C. K., and Kolodner, K. B. (1993). Predicting ambulatory blood pressure during school: Effectiveness of social and nonsocial reactivity tasks in black and white adolescents. *Psychophysiology* 30: 30–38.

Ewart, C. K., Taylor, C. B., Kraemer, H. C., and Agras, W. S. (1984). Reducing blood pressure reactivity during interpersonal conflict: Effects of marital communication training. *Behav. Ther.* 15: 473–484.

Ewart, C. K., Taylor, C. B., Kraemer, H. C., and Agras, W. S. (1991). High blood pressure and marital discord: Not being nasty matters more than being nice. *Health Psychol.* 10: 155–163.

Farmer, J. A., and Gotto, A. M. (1997). Dyslipidemia and other risk factors for coronary artery disease. In Braunwald, E. (ed.), *Heart Disease: A Textbook of Cardiovascular Medicine*, 5th ed., W. B. Saunders, Philadelphia, pp. 1126–1160.

Fogarty, T. F. (1976). Marital crisis. In Guerin, P. J. (ed.), *Family Therapy: Theory and Practice*, Gardner Press, New York.

Frankish, C. J., and Linden, W. (1996). Spouse-pair risk factors and cardiovascular reactivity. *J. Psychosom. Res.* 40: 37–51.

Genest, J., and Cohn, J. S. (1995). Clustering of cardiovascular risk factors: Targeting high-risk individuals. *Am. J. Cardiol.* 76: 8A–20A.

Gottman, J. M. (1979). *Marital Interaction: Experimental Investigations*, Academic Press, New York.

Gottman, J. M. (1990). How marriages change. In Patterson, G. R. (ed.), *Depression and Aggressions in Family Interaction*, Lawrence Erlbaum Associates, Hillsdale, NJ.
Gottman, J. M. (1991). Predicting the longitudinal course of marriages. *J. Marit. Family Ther.* 17: 3–7.
Gottman, J. M. (1994). *What Predicts Divorce? The Relationship Between Marital Processes and Marital Outcomes*, Lawrence Erlbaum Associates, Hillsdale, NJ.
Gottman, J. M., and Krokoff, L. J. (1989). The relationship between marital interaction and marital satisfaction: A longitudinal view. *J. Consult. Clin. Psychol.* 57: 47–52.
Gottman, J. M., and Levenson, R. W. (1988). The social psychophysiology of marriage. In Noller, P., and Fitzpatrick, M. A. (eds.), *Perspectives on Marital Interaction*, Multilingual Matters, Clevedon, UK.
Gottman, J. M., and Levenson, R. W. (1992). Marital processes predictive of later dissolution: Behavior, physiology, and health. *J. Person. Soc. Psychol.* 63: 221–233.
Greenberg, L. S., and Johnson, S. M. (1988). *Emotionally Focused Therapy for Couples*, Guilford, New York.
Heavey, C. L., Layne, C., and Christensen, A. (1993). Gender and conflict structure in marital interaction: A replication and extension. *J. Consult. Clin. Psychol.* 61: 16–27.
Heavey, C. L., Christensen, A., and Malamuth, N. M. (1995). The longitudinal impact of demand and withdrawal during marital conflict. *J. Consult. Clin. Psychol.* 63: 797–801.
Hotz, S. B. (1995). Stress and cardiovascular disease risk behaviours: Implications for health behaviour change. *Can. J. Cardiol.* 11 (Suppl. A): 8A–11A.
Howes, D. G. (1998). Cardiovascular disease and women. *Lippincott's Primary Care Pract.* 2: 514–524.
Jennings, J. R., Kamarck, T., Manuck, S., Everson, S. A., Kaplan, G., and Salonen, J. T. (1997). Aging or disease? Cardiovascular reactivity in Finnish men over the middle years. *Psychol. Aging* 12: 225–238.
Johnson, S. M. (1996). *The Practice of Emotionally Focused Marital Therapy: Creating Connection*, Brunner/Mazel, New York.
Kamarck, T. W., Jennings, J. R., Debski, T. T., Glickman-Weiss, E., Johnson, P. S., Eddy, M. J., and Manuck, S. B. (1992). Reliable measures of behaviorally-evoked cardiovascular reactivity from a PC-based test battery: Results from student and community samples. *Psychophysiology* 29: 17–28.
Kamarck, T. W., Jennings, J. R., Pogue-Geile, M., and Manuck, S. B. (1994). A Multidimensional measurement model for cardiovascular reactivity: Stability and cross-validation in two adult samples. *Health Psychol.* 13: 471–478.
Klein, R. C. A., and Johnson, M. P. (1997). Strategies of couple conflict. In Duck, S. (ed.), *Handbook of Personal Relationships*, 2nd ed., Wiley, Chichester, UK, pp. 469–486.
Klinetob, N. A., and Smith, D. A. (1996). Demand-withdraw communication in marital interaction: Tests of interpersonal contingency and gender role hypotheses. *J. Marriage Family* 58: 945–957.
Komarovsky, M. (1962). *Blue-Collar Marriage*, Random House, New York.
Krantz, D. S., and Manuck, S. B. (1984). Acute psychophysiologic reactivity and risk of cardiovascular disease: A review and methodologic critique. *Psychol. Bull.* 96: 435–464.
Lash, S. J., Gillespie, B. L., Eisler, R. M., and Southard, D. R. (1991). Sex differences in cardiovascular reactivity: Effects of the gender relevance of the stressor. *Health Psychol.* 10: 392–398.
Lassner, J. B., Matthews, K. A., and Stoney, C. M. (1994). Are cardiovascular reactors to asocial stress also reactors to social stress? *J. Person. Soc. Psychol.* 66: 69–77.
Lawler, K. A., Wilcox, Z. C., and Anderson, S. F. (1995). Gender differences in patterns of dynamic cardiovascular regulation. *Psychosom. Med.* 57: 357–365.
Levenson, R. W., and Gottman, J. M. (1983). Marital interaction: Physiological linkage and affective exchange. *J. Person. Soc. Psychol.* 45: 587–597.
Levenson, R. W., and Gottman, J. M. (1985). Physiological and affective predictors of change in relationship satisfaction. *J. Person. Soc. Psychol.* 49: 85–94.

Light, K. C., Turner, J. R., Hinderliter, A. L., and Sherwood, A. (1993). Race and gender comparisons: I. Hemodynamic responses to a series of stressors. *Health Psychol.* 12: 354–365.
Locke, H. J. (1951). *Predicting Adjustments in Marriage: A Comparison of a Divorced and a Happily Married Group*, Henry Holt, New York.
Manuck, S. B. (1994). Cardiovascular reactivity and cardiovascular disease: "Once more unto the breach." *Int. J. Behav. Med.* 1: 4–31.
Matthews, K. A., Manuck, S. B., and Saab, P. G. (1986). Cardiovascular responses of adolescents during a naturally occurring stressor and their behavioral and psychophysiological predictors. *Psychophysiology* 23: 198–209.
Murphy, J. K., Stoney, C. M., Alpert, B. S., and Walker, S. S. (1995). Gender and ethnicity in children's cardiovascular reactivity: 7 years of study. *Health Psychol.* 14: 48–55.
O'Leary, K. D., and Arias, I. (1983). The influence of marital therapy on sexual satisfaction. *J. Sex Marit. Ther.* 9: 171–181.
O'Leary, K. D., Fincham, F., and Turkewitz, H. (1983). Assessment of positive feelings toward spouse. *J. Consult. Clin. Psychol.* 51: 949–951.
Pennebaker, J. W. (1982). *The Psychology of Physical Symptoms*, Springer-Verlag, New York.
Potempa, K. (1994). An overview of the role of cardiovascular reactivity to stressful challenges in the etiology of hypertension. *J. Cardiovasc. Nurs.* 8: 27–38.
Price, J. F., and Fowkes, G. R. (1997). Risk factors and the sex differential in coronary artery disease. *Epidemiology* 8: 584–591.
Raush, H. L., Barry, W. A., Hertel, R. K., and Swain, M. A. (1974). *Communication, Conflict, and Marriage*, Jossey–Bass, San Francisco.
Ross, C. E., Mirowsky, J., and Goldsteen, K. (1990). The impact of the family on health: The decade in review. *J. Marriage Family* 52: 1059–1078.
Rubin, L. B. (1983). *Intimate Strangers: Men and Women Together*, Harper & Row, New York.
Smith, T. W., and Brown, P. C. (1991). Cynical hostility, attempts to exert social control, and cardiovascular reactivity in married couples. *J. Behav. Med.* 14: 581–592.
Smith, T. W., and O'Keefe, J. L. (1988). Cross-situational consistency of cardiovascular reactivity. *Biol. Psychol.* 27: 237–243.
Spanier, G. (1976). Measuring dyadic adjustment: New scales for assessing the quality of marriage and similar dyads. *J. Marriage Family* 38: 15–28.
Spanier, G. B., and Filsinger, E. (1983). The Dyadic Adjustment Scale. In Filsinger, E. (ed.), *Marriage and Family Assessment*, Sage, Beverly Hills, CA.
Stoney, C. M., Davis, M. C., and Matthews, K. A. (1987). Sex differences in physiological responses to stress and in coronary heart disease: A causal link? *Psychophysiology* 24: 127–131.
Sullaway, M., and Christensen, A. (1983). Assessment of dysfunctional interaction patterns in couples. *J. Marriage Family* 45: 653–660.
Terman, L. M., Bettenweiser, P., Ferguson, L. W., Johnson, W. B., and Wison, D. P. (1938). *Psychological Factors in Marital Happiness*, McGraw–Hill, New York.
Turkewitz, H., and O'Leary, K. D. (1981). A comparative outcome study of behavioral marital therapy and communication therapy. *J. Marit. Family Ther.* 7: 159–169.
View Film & Video, Inc. (1985). *Couples Arguing* (videotape). (Available from Filmakers Library, 124 East 40th Street, New York, NY 10016.)
Wile, D. B. (1981). *Couples Therapy: A Non-traditional Approach*, Wiley, New York.