AN ECOLOGICAL MOMENTARY INVESTIGATION OF SPOUSAL
INTERACTIONS AND AFFECT IN COUPLES WITH CHRONIC LOW BACK PAIN

A Dissertation

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Supportive relationships enhance mood and patient adjustment (Stanton, Revenson, & Tennen, 2007). However, unsupportive or critical relationships lead to relapse and poor outcomes in both mental and physical disorders (Wearden et al., 2000). The converse is also true. Patient adjustment, specifically patient mood, influences the amount of support or criticism given by spouses (Gotlib & Beach, 1995; Revenson, 1994). Both spouses in couples with Chronic Low Back Pain (CLBP) have higher than average rates of depression (Schwartz & Ehde, 2000) and marital discord (Leonard, Cano, & Johansen, 2006). Therefore, relational models describing how depression and
unsupportive behavior develop in both spouses are necessary for understanding problems that these couples face.

We examined bidirectional relationships between spousal affect and behavior in a sample of 105 married couples with one spouse experiencing CLBP. Ecological momentary assessment (EMA; Shiffman, Stone, & Hufford, 2008) with electronic diaries was used to obtain reports of patient and spouse affect as well as criticism and support for five times a day over 2 weeks. Hierarchical linear modeling was used to investigate both concurrent and lagged associations between behavior (criticism and support) and depressed affect.

As hypothesized, both within- and cross-spouse associations between criticism and depressed affect were significant when both criticism and depressed affect were measured at the same time point. Contrary to expectations, only some within- and cross-spouse associations between support and depressed affect were significant at the same time point. Results from lagged models of criticism and depressed affect suggested that there are bidirectional relationships between spouse criticism and spouse depressed affect; as well, they highlighted the role of spouse depressed affect in predicting patient criticism. Lagged models of support were similar to those for criticism. These results highlight the implications of being critical and providing support as well as the role of spouse affect in generating marital conflict. Results also call for the importance of expanding theory and interventions to address not only patient affect but also spouse depressed affect as it may be a stress generating vehicle leading to both spouse and patient criticism and support.
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CHAPTER 1:

INTRODUCTION

Chronic pain is usually defined as persistent pain lasting 6 months beyond expected healing time (Schwartz & Ehde, 2000). Chronic pain is one of the most prevalent and costly health problems in the United States (National Center for Health Statistic's Health, 2006). It affects more Americans than heart disease, cancer, and diabetes combined (National Center for Health Statistic's Health, 2006). Pain accounts for more than 80% of all physician visits and costs more than $70 billion a year in doctor visits, missed work days, and lost income (Gatchel, 2004). Chronic Low Back Pain (CLBP) is the most common type of pain (National Center for Health Statistic's Health, 2006). Approximately 25% of adults report that, in the past 3 months, they have experienced low back pain (National Center for Health Statistic's Health, 2006). This number rises to about 70 to 85% of people when asking about the prevalence of back pain at any point in people’s lives (National Center for Health Statistic's Health, 2006). Recognizing the high toll taken by chronic pain in general, and CLBP in particular, researchers have responded by exploring factors associated with the development and maintenance of pain conditions. In doing so, they have found that in addition to being a substantial problem in its own right, chronic pain also significantly impacts patient mood (Banks & Kerns, 1996) and relationships (Leondard, Cano, & Johansen, 2006). These
disruptions to mood and relationships can, in turn, exacerbate and prolong pain (Gatchel, Bo Peng, Peters, Fuchs, & Turk, 2007). Because of the overlap between mood disturbance, relationship problems, and pain, it is important that models of pain account not only for pain but also for mood disturbance and relationship discord. We now review the association between mood disturbance and pain, specifically between depression and CLBP. We then highlight psychosocial models that have been developed to explain both the development of depression and relationship discord in couples in general, and in couples with CLBP specifically.

1.1 CLBP and Depression

It is well established that CLBP and other pain conditions are highly comorbid with depression (Banks & Kerns, 1996; Gatchel et al., 2007). Depression is more prevalent in pain patient samples than it is in both the general population and in samples of people suffering from chronic medical conditions such as cancer, heart disease, and neurological illnesses (Banks & Kerns, 1996). In their comprehensive review, Banks and Kerns (1996) estimated that approximately 30-54% of patients with chronic pain may be experiencing major depressive disorder (MDD) at any point, whereas in the general population lifetime rates are between 5-17%.

Not only has it been well established that depression and pain are related, evidence also suggests that pain may bring about and perpetuate depression (Gatchel et al., 2007). This is perhaps because pain is not only a physical sensation but is also a negative affective experience (Mersky, 1986). Over time momentary bouts of pain and negative affect could lead to longer term depression. Indeed, increases in momentary
negative affect predict longer lasting depression (Kuppens, Van Mechelene, Nezlek, Dossche, & Timmermans, 2007; McConville & Cooper, 1996). It has also been documented that in some cases, pain temporally precedes depression and depressive symptoms (Banks & Kerns, 1996) as well as increases in general negative affect (Feldman, Downey, Schaffer-Neitz, 1999). Furthermore, once pain leads to depression, depression can also contribute to increased pain intensity so that the pain-depression relationship becomes an ongoing cycle (Gatchel et al., 2007). Finally, not only is this pain-depression cycle problematic, depression in patients itself contributes to a number of negative outcomes including early termination of pain treatment (Kerns & Haythornthwaite, 1988). In sum, researchers have begun to study the development of depression in pain for at least three following reasons: (1) because depression in pain patients is highly prevalent; (2) because once it develops, depression can exacerbate pain; and (3) because depression is related to poor functioning and adherence to pain treatment.

1.2 Psychosocial Models of Depression

To explain the development of depression in chronic pain patients, researchers have adapted theories from the depression literature that focus on the role of psychosocial mechanisms in the development and maintenance of depression (Banks & Kerns, 1996; Campbell, Clauw, & Keefe, 2003). Specifically, researchers from both the psychopathology and pain traditions highlight the central role that social relationships, especially marital relationships, play in the development and maintenance of depression. Two main types of psychosocial models pervade the literature: diathesis-stress and stress
generation models. We now present a brief overview of each of these models and discuss how they have been applied to the development of depression in chronic pain patients.

1.2.1 Diathesis-stress models. In diathesis-stress models, depression arises as a reaction to stressful life events in those possessing certain vulnerabilities, such as certain genetic predispositions, a history of depression, or cognitive styles. Two of the most prominent diathesis-stress models explaining the development of depression are the expressed emotion (EE) model (Hooley & Gotlib, 2000; Vaughn & Leff, 1976) and the marital discord model of depression (Beach, Sandeen, & O’Leary, 1990). The EE model originally developed out of psychopathology research and thus attempts to describe family factors contributing to relapse in psychopathology. In the EE model, families can be a source of stress that exacerbate depressive symptoms or produce depressive relapse in those vulnerable to depression. Specifically, relatives who express a high degree of EE (e.g., criticism), create stress for patients; this stress then contributes to patient relapse. Families however, can also be sources of support. Supportive relationships with spouses can actually protect against future depression in the face of stress (Brown & Harris, 1978).

A parallel model, mainly developing from the marital literature, is the marital discord model of depression (Beach et al., 1990). This model asserts that marital discord leads to depression because of an increase in stress and a decrease in support. Stress and support are both defined by a number of specific factors. Included in the definition of stress are criticism and blame. Support is defined as things such as self-esteem support and coping assistance. In all, spousal criticism and support are both independent pathways contributing to the development of depression in maritaly discordant couples.
Both the EE model and the marital discord model have analogous models in the pain literature. Models of the development of depression in chronic pain posit that patients may have certain diatheses (e.g., negative schemas or maladaptive attributions) and develop depression in the face of stressors such as invalidation from doctors or functional disability (Banks & Kerns, 1996). In their comprehensive review of marital distress and adjustment in chronic pain couples, Leonard and colleagues (2006) have also added marital stressors, such as stressful interactions with spouses, to the list of factors that may bring about depression in chronic pain patients and spouses. They also highlight the role of positive marital interactions (Leonard et al., 2006). Therefore, diathesis-stress models in all three lines of research propose that negative interactions with spouses or others are stressors that bring about and perpetuate depression in vulnerable people. Supportive relationships can lead to positive outcomes or at the least, can protect against the negative effects of stress.

1.2.2 Stress generation models. A second class of models in the depression literature are stress generation models. In contrast to diathesis-stress models, these models highlight the active role that depressed people play in creating their own relationship stress (Hammen, 2006). These theories posit that by behaving in certain ways, such as by seeking reassurance excessively, by solving problems poorly, or by being unsupportive of spouses, depressed people create conflict in their relationships (Davila, Bradbury, Cohan, & Tochluk, 1997; Hammen, 1991, 2006; Coyne, 1976). Such conflict and consequent rejection can then contribute to further depression.

Stress generation theories in the pain literature are less well developed than they are in the depression literature. However, like in the depression literature, empirical
studies have focused on the relationship between pain and relationship discord. It has
been consistently documented that patients and their spouses have higher levels of
relationship discord than community control couples (Turk, Flor, & Rudy, 1987;
Schwartz & Ehde, 2000), suggesting that patients may contribute to marital conflict.
There is also evidence that pain temporally precedes marital dissatisfaction (Maruta,
Osborne, Swansom, & Halling, 1981), suggesting that the physical or psychological
symptoms of pain may lead to general declines in marital satisfaction. Other evidence
indicates that patients may be contributing to specific aspects of marital discord in that, in
observationally coded marital interactions, both spouses and patients display less
facilitative behavior, such as compliments, encouragement, or praise than spouses
without pain (Romano, Turner, Friedman, Bulcroft, Jensen, & Hops, 1991). While these
links between pain and marital discord have been well documented, far fewer studies, or
theoretical speculations have explored the role of patient depression in accounting for
why pain patients and spouses have such high levels of marital discord and less positive
interactions with spouses.

1.2.3 Limitations of current models. In the pain literature, there are gaps in both
theoretical models and in empirical studies of the development of depression and marital
discord. In this section we present some of the important limitations of current models
and in the next sections we review our plan to address some of those limitations.

In the pain literature, diathesis-stress models associating marital factors with
depression are relatively new (Leonard et al., 2006). Stress generation models for pain
have not yet been developed. However, empirical studies have implicitly or explicitly
tested parts of both these theories in pain samples. Perhaps because these conceptual
models have been developed secondary to empirical evidence of the relationship between depression, marital discord, and pain, few studies have directly tested both models in the same study. Lacking investigations that include both models in the same study, it is hard to determine how well the diathesis-stress and stress generation theories map onto empirical data and how they may compare to one another in their fit with the data. To establish the superiority of one theory over another or to establish how well both models apply (i.e., that bidirectional relationships exist between mood and behavior), the same study must test both how spousal behavior is related to later mood and also how mood is related to later spousal behavior.

Apart from not testing both theoretical models simultaneously, most studies have not examined both spouses simultaneously. In other words, most investigators have failed to take a relational approach to data collection. As a result, they have not examined the contributions of both spouses to relationship discord and depression (Leonard et al., 2006). With both spouses available, it is possible to examine a complete relational model that includes four major effects, which are graphically depicted and individually enumerated in Figure 1. As will be seen later in this manuscript when current evidence is reviewed for each of the paths in both diathesis-stress and stress generation models, some of these four pathways have yet to be investigated whereas some have been extensively investigated. For example, research on EE models has focused on relatives’ criticism and patient mood (path $d$). However, there also may be links between patient criticism and relatives’ mood (path $c$) as well as links between criticism of one’s spouse to one’s own mood (paths $a$ and $b$). Similarly, stress generation models (see Figure 2) have focused primarily on patient mood and the resulting behavior of the patient (path $a$) or on spouse
behavior in reaction to patient mood (path c). However, paths from spouse mood to subsequent patient behavior may also be important (path d). In general, omitting certain paths in these models may lead to biased estimates of the most theoretically important paths, especially given the high degree of correlation among spousal behavior and moods. For example, when testing the relationship between spousal criticism and later patient affect, it is also worth controlling for patients’ own criticism in order to separate the effects of spousal criticism and patient criticism on patient affect. In addition to failing to include or control for the contributions of both patients and spouses, some of these neglected relationships, though crucial for various theoretical models, have yet to be empirically tested. Furthermore, where they are not incorporated into theory, empirical evidence for new pathways may help expand current theoretical models. In all, failure to investigate marital behavior and mood using a relational framework has sharply limited the scope and theoretical yield of empirical work in this area.

Figure 1: A diathesis-stress model.
Finally, while many studies have focused on global relationship perceptions few have documented links between depression and marital factors, like criticism and support, in a micro-analytic way. That is, evidence for direct links between specific marital factors associated with specific instances of depressed affect is lacking. As well, few investigations into the diathesis-stress models have explored direct links between relatives’ criticism or support and patients’ immediate reactions. Similarly, few investigations into stress-generation models have explored direct links between patients’ specific stress-generating behavior and relatives’ immediate reactions (Hammen, 2006) or between patients’ demonstrations of depressed affect and relatives’ immediate reactions. As a result, it is unclear how affect and spousal behavior (support and criticism) are more directly related in time (Leonard et al., 2006).

Given these three limitations, we improved upon previous work using three strategies. To address the first limitation, we tested both directions of the relationship between spousal affect and spousal behavior in the same study. That is, we tested both...
diathesis-stress and stress generation models. We addressed the second and third limitations mentioned in this section with two innovative techniques: ecological momentary assessment (EMA; Shiffman, Stone, & Hufford, 2008) and the Actor-Partner Interdependence model (APIM; Kenny, Kashy, & Cook, 2006). These two innovations are described next.

1.3 Ecological Momentary Assessment

EMA can be used for many purposes. We used EMA to obtain repeated measurements of constructs as they naturally occurred in the lives of couples outside the laboratory. Our use of EMA helped us measure specific micro-behavior of spouses and how they are temporally related to specific momentary affective states. Therefore, instead of capturing broad relationships between global self-reported depressive symptoms and global measures of marital adjustment or spousal behavior, we took measurements of spouses at more frequent intervals (every 3 hours) so that we could see how specific instances of spousal support or criticism relate to affect.

In addition to addressing the limitation of current studies that do not explore micro-relations between behavior and affect, the use of EMA is advantageous for several other reasons. First, EMA allowed us to capture relations between affect and behavior as they occurred in the everyday lives of our participants so as to provide us with more “ecologically valid” (Shiffman et al., 2008, p. 4) assessments than would have been available in a laboratory setting. Such assessments are especially important when investigating behavior that may have a social desirability component, such as criticizing a spouse who is coping with chronic illness. Second, EMA minimizes reporting and
memory biases and thus strengthens validity of measures of affect, support, and criticism (Bolger, Davis, & Rafaeli, 2003; Shiffman et al., 2008). Third, EMA allowed us to monitor participants multiple times a day. These multiple assessments permitted us to study temporal relations between affect and behavior. Having multiple time points also made our cross-sectional assessment of the relation between affect and behavior more reliable as it was based on aggregated ratings over time and over a variety of settings (Bolger et al., 2003; Shiffman et al., 2008). In sum, using EMA helped us obtain more reliable and valid measurements and allowed us to investigate real-time interactions between spouses on a “micro” rather than a “macro” or global level. This enabled us to better understand the dynamic nature of the relation between specific instances of spousal criticism and support and specific instances of spousal affect as they occur and possibly co-occur in the every-day lives of couples.

1.4 The Actor-Partner Interdependence Model

In addition to EMA, we used the APIM to overcome limitations of previous studies. Specifically, we used the APIM to take a relational approach to data analysis and collection. As illustrated in Figure 1, the APIM simultaneously captures the entire spousal relationship at once. In other words, it provides a way to investigate relationships using a couple-oriented approach that permits analyses of all four pathways in a dyadic model. In this model, there are two main types of effects: “actor” and “partner” effects (Kenny et al., 2006). In the conceptual model shown in Figure 1, actor effects (paths $a$ and $b$) refer to within-person relations between affect and behavior. Partner effects (paths $c$ and $d$) refer to cross-spouse relations between spouse affect and partner behavior. Since
both actor and partner effects are included in the model, testing for either an actor or partner effect means that the other effect is controlled. For example, when testing an actor or within-person effect, the partner or cross-spouse effect is controlled for. For each model in the current study, there are two actor effects and two partner effects because there are two different members in the dyad. Specifically, because the model in Figure 1 is for “distinguishable dyads”, one actor effect is for the patients and one is for the spouses of the patients. We chose to use the “distinguishable dyads” approach where spouses are distinguished on their basis of some trait - in this case their status as patients or spouses. Using this model will allow us to be consistent with previous work that, for the most part, routinely distinguishes between patients and spouses because of important differences between the two kinds of partners. From this point forward in the manuscript we will use the terms “patient” and “spouse” (the partner without CLBP) to distinguish partners from each other.

1.5 The Purpose of the Study

The main purpose of this study is to explore relationships between depressed affect and marital behavior (spousal criticism and support) in a sample of couples where one spouse has CLBP. CLBP is of particular interest in regards to these constructs (depression, criticism, and support) because the disease is linked with clinical depression and is often times unexplainable, unpredictable, and chronic. Because of these features, the disease may be especially frustrating and disruptive for patients and spouses alike. Likewise, patients may elicit criticism and rejection from others while at the same time may require large amounts of support to cope with the disease. In any case, accounting
for spousal criticism, support, and depression is important for psychosocial conceptualizations of the CLBP.

We studied both diathesis-stress and stress-generation conceptualizations of the relations between depressed affect and behavior to see if criticism and support predicted depressed affect (i.e., the diathesis-stress conceptualization) or if depressed affect predicted criticism and support (i.e., the stress-generation conceptualization). It is important to note that we used the terms “diathesis-stress” and “stress generation” to refer to our models in order to distinguish between the directions of the relationships between affect and behavior as would be hypothesized by each model. However, we did not directly test each theory as our models expanded upon what each theory has traditionally encompassed. Our main purpose then was to examine the contributions of both patient and spouse affect and behavior to both patient and spouse affect and behavior and to study the direction of these relationships (i.e., if behavior predicts affect or if affect predicts behavior). If relations between affect and behavior held in both directions, we were to conclude that their relationship is bi-directional (Cook & Kenny, 2005).

Our main focus was on within- and cross- spouse relations between behavior (criticism and support) and depressed affect. We tested both concurrent (cross-sectional) and lagged associations. Lagged associations of behavior and affect helped us establish the direction of the relationship between these two constructs. After conducting our main analyses, we conducted exploratory analyses of associations between behavior and other forms of affect implicated in adjustment to CLBP (e.g., anger, anxiety, and positive affect).
In the next section we present a more detailed overview and background research on each of the main models we proposed. In doing so, we present evidence regarding the cross-spouse (partner effects) and within-person (actor effects) paths in each of the models (see Figures 1 and 2 for sample diathesis-stress and stress generation models, respectively). Because the literature has focused on some APIM paths (e.g., partner effects from spousal behavior to patient mood) while neglecting others (e.g., actor effects), the sections detailing previous research on APIM paths will be somewhat uneven in regards to the amount of background research that is presented for each path. Likewise, because not all paths have been tested in samples with pain patients, some sections (e.g., actor effects in models of support) may draw heavily from literature other than health psychology. Such literature is either from couples with one clinically depressed spouse or from community couples. We use examples from the depression literature because many of the pain patients in our sample will be clinically depressed and thus findings from studies of clinically depressed patients may also apply to pain patients. We use examples from community couples because even though pain couples may be dealing with specific challenges or have elevated levels of depressive symptoms, to the extent that the processes we study are relatively universal and exist on a continuum they may also apply to pain couples. Because the studies of community couples make no distinction between effects for the patient or for the spouse, in the sections that draw from studies of community couples, we do not distinguish patient effects from spouse effects.
1.6 Does Criticism Lead to Depression?

1.6.1 Partner effects. In several prominent psychosocial models of psychopathology, (e.g., the EE model and the marital discord model of depression), criticism from spouses leads to a variety of negative patient outcomes. Empirically, these theories have received wide support. Criticism from spouses is a generic stressor linked to marital distress, poor outcomes in health conditions, poor treatment response, and relapse in mental disorders (Hooley & Gotlib, 2000; Wearden, Tarrier, Barrowclough, Zastowny, & Rahill, 2000). Out of all psychological disorders, depression appears to be especially related to criticism (Butzlaff & Hooley, 1998). For example, in their meta-analysis of EE in depression, schizophrenia, and eating disorders, Butzlaff and Hooley (1998) found that depressed patients relapse after being exposed to less criticism than do people with schizophrenia. The importance of criticism in predicting not only clinical depression but also depressive symptoms is highlighted in a recent review of perceived criticism by Renshaw (2008). As he notes, although some studies of clinically depressed patients have failed to detect a relation between concurrent depressive symptoms and perceived criticism, most studies have found concurrent or prospective relationships between perceived criticism and depression, depressive symptoms, and negative affect. He concludes that across a wide variety of samples, perceived criticism from family members has a “consistent” relation to depression (p. 527).

In comparison to the number of studies involving psychiatric or community samples, there have been fewer studies investigating the relation between criticism and depression within samples of patients with medical illnesses and even fewer still in chronic pain samples. Of the studies that have been conducted, evidence suggests that
criticism from relatives does lead to patient depression. For example, perceived spousal criticism measured when women underwent treatment for early stage breast cancer, predicted women’s general psychological distress 18 months later (Manne, Ostroff, Winkel, Grana, & Fox, 2005). While there have not been analogous longitudinal studies of general spousal criticism and depression in pain samples, there is cross-sectional evidence to suggest that this relationship may exist in pain samples. Manne and Zautra (1989) found that in a sample of women with rheumatoid arthritis (RA), husbands’ critical remarks about wives as coded by outside observers during an interview, were significantly related to wives’ psychological adjustment. In CLBP patients specifically, spousal criticism has been studied in the context of spousal punishing responses to pain behavior. Several studies have replicated the finding that spousal punishing responses, but not solicitous or distracting responses, are significantly correlated with depressive symptoms but are not necessarily correlated with pain intensity (Kerns, Haythornthwaite, Southwick, & Giller Jr., 1990; Kerns, Southwick, Giller, Haythornthwaite, Jacob, & Rosenberg, 1991). Therefore, spousal punishing or critical responses in relation to pain demonstrations by patients may be unique in predicting patient dysphoric mood in comparison to other indicators of patient adjustment. Given that criticism is at least cross-sectionally related to psychological distress in pain samples and can predict later distress in other medical, community, and psychiatric samples, it is likely that spousal criticism also predicts CLBP patients’ depressed mood.

The majority of empirical studies investigating cross-spouse relations between criticism and mood have investigated the path from spousal criticism to patient mood (path d in Figure 1). However, the other cross-spouse path from patient criticism to
spouse mood (path c in Figure 1) has not received as much attention. Focusing on this path may be important because spouses of pain patients have rates of depression higher than those seen not only in the general population, and in partners of patients with other medical illnesses (Flor et al., 1987). Therefore, it would be helpful to account for the development of depression in spouses of CLBP patients. Behavior by pain patients may play a role in spouse depression (Leonard & Cano, 2006; Schwartz, Slater, Birchler, & Atkinson, 1991). For example, Schwartz and colleagues (1991) found that in comparison to a number of predictors (patient pain, patient internal resources, patient emotional distress, and spousal marital satisfaction), patient pain intensity and patient anger/hostility were most highly associated with spouse depressive symptoms. Patient pain intensity and patient anger/hostility uniquely predicted 16 and 8% of the variance in spouse depressive symptoms, respectively. Therefore, to the degree that patients express anger and criticism toward their spouse, patients might contribute to spouse depression.

1.6.2 Actor effects. While the EE literature emphasizes cross-spouse relations between criticism and mood, there also may be within-person relations between criticism and mood (paths a and b in Figure 1). Criticizing spouses may perpetuate peoples’ own depression. For example, criticizing a loved one might contribute to negative affect to the extent that one did not mean to act negatively towards one’s spouse or to the extent that one feels guilty for his or her behavior. Depression after criticizing spouses may be characteristic of spouses of patients with chronic medical conditions as they may experience even stronger guilt for criticizing suffering loved ones than they would if they criticized a partner who did not have an illness. This cycle of criticism and depression then may be an additional factor accounting for the higher than average rates of
depression in spouses of patients with medical conditions such as CLBP (Flor et al., 1987). Therefore, it is important to empirically determine if being critical toward patients can influence spouses’ own mood.

In addition, accounting for actor effects of one’s own criticism on one’s own mood is important to obtain accurate estimates of the more traditional pathway in the EE literature, the cross-spouse pathway from spouse criticism to patient mood (path d in Figure 1). Theory and empirical evidence indicate that high levels of relatives’ criticism are associated with high levels of patient criticism of relatives (Hooley, 2007). Therefore, if the relationship between patient criticism of spouses and patient depressed mood is not accounted for, the existence of this association may add to the predictive power of relatives’ criticism on patient mood. In other words, if this actor effect is not controlled for, it will inflate the estimate of the important cross-spouse effect from spouse criticism to patient mood (path d of Figure 1). In sum, the presence of significant actor effects in the EE model may ultimately reveal a new mechanism that explains the development of depression. Regardless, it is important to include actor effects in cross-spouse EE models so that accurate estimates of cross-spouse effects can be obtained.

1.7 Does Depression Lead to Criticism?

1.7.1 Partner effects. In comparison to the EE model according to which relatives’ criticism results in depressive symptoms in patients, stress generation models of depression posit that depressed people or those vulnerable to depression generate interpersonal stress (Hammen, 1991, 2006) and are eventually rejected by others (Coyne, 1976; Segrin & Abramson, 1994). Numerous studies have supported stress generation
theories by showing that depressed people have more frequent interpersonal conflicts
(Hammen, 1991) and also that such conflicts or interactions with others are more
negative than interactions involving non-depressed people (Gotlib & Beach, 1995; Segrin
& Abramson, 1994).

As a specific dimension of interpersonal conflict, cross-sectional evidence from a
community sample of married couples indicates that depressive symptoms are related to
criticism from spouses (Smith & Peterson, 2008). However, such results have not applied
to clinical samples (Hooley & Teasdale, 1989; Riso, Klein, Anderson, Ouimette, &
Lizardi, 1996). This inconsistency may be due to a restriction of range seen when using
depressive symptoms in clinical samples. Perhaps all patients in clinical samples have
enough depressive symptoms to elicit high levels of criticism from spouses, but in
community samples, the continuum of depressive symptoms represented reveals the
actual association with spouse criticism. In any event, whether depressive symptoms are
cross-sectionally associated with spouse criticism is an empirical question that needs to
be tested and replicated in a wide variety of samples, including couples with chronic
illness.

In addition to these tentative cross-sectional relationships between criticism and
mood, it is unclear whether depressed affect actually *elicits* spousal criticism over time. It
is easy to imagine however, how demonstrations of depressed affect might promote
partner criticism. Because of depression’s association with hopelessness, lack of interest,
and self-criticism, witnessing depressed affect in a partner might be frustrating for
spouses. This frustration may then prompt criticism. Furthermore, depression may
indicate poor coping (Revenson, 1994). It follows then, that spouses may criticize
partners to the extent that they use criticism to motivate depressed patients to take more responsibility or to more actively cope with problems (Hooley, 1985, 1987). In all however, just as more work needs to be done investigating cross-sectional relations between spousal criticism and depressed mood, more investigations need to test whether specific demonstrations of depressed affect can actually elicit criticism from spouses.

1.7.2 Actor effects. Studying the specific actor effect of how depressed mood may lead to later negative behavior (paths $a$ and $b$ in Figure 2) would fill important theoretical gaps revealed in recent reviews of both the EE (Hooley, 2007) and stress generation literatures (Hammen, 2006). These effects may be important for EE models in that they may help explain why relatives might be critical of patients (Hooley, 2007) in that relatives’ depression may lead to relatives’ criticism. These effects are also important for stress generation models because they may help explain the exact mechanism (i.e., criticism) through which depressed people contribute to relationship discord (Hammen, 2006).

While we do not know if depression actually leads to later criticism and negative behavior, it appears that at least cross-sectionally depression is related to social skills deficits (Segrin & Abramson, 1994) and to acting negatively towards others, including spouses (Rehman, Gollan, & Mortimer, 2008). For example, in laboratory coded interactions with husbands, depressed wives emit more self-criticisms and complaints than non-depressed controls (Biglan, Hops, Sherman, Friedman, Arthur, & Osteen, 1985). In addition to such negative behavior, depression is also associated with specific cognitive features that may make people prone to being critical. For example, depression is associated with generally negative views (Ingram, Miranda, & Segal, 1998) as well as
negative attributions for spousal behavior (Coop-Gordon, Friedman, Miller, & Gaertner, 2005; Ueblacker & Whisman, 2005). Therefore such cognitions accompanying depressed mood may result in noticing more negative things in spouses to criticize (Manne, Alfieri, Taylor, & Dougherty, 1999; Peterson, Smith, & Windle, 2009).

Although theory and evidence suggest that depression is at least cross-sectionally associated with being critical, evidence of this association has been equivocal. For example, in a study of couples from the community, Smith and Peterson (2008) found that depressive symptoms were related to how critical spouses intended being of partners in general. However, when engaging in a laboratory social support interaction with spouses, partners’ depressive symptoms were not related significantly to either the amount of criticism they intended or to how critical they were of spouses as rated by outside observers (Smith & Peterson, 2008). Perhaps these conflicting results were due to the fact the laboratory interaction task used in this study was a variation of a social support task (e.g., Pasch & Bradbury, 1998) and elicited very low levels of criticism from all participants. Despite such results, when looking at samples of relatives of patients with clinical depression, relatives who are critical do not appear to have significantly more clinical depression, leading some to conclude that relatives’ critical responses have more to do with their personality or how they handle stress than their own psychopathology (Hooley, 2007; Peterson, Villines, Rose, & Smith, 2006). If this is the case however, it is likely then that depressed affect, perhaps as an indicator of momentary coping resources, as opposed to clinical depression, would be related to criticizing spouses. Clearly, more evidence needs to be gathered about whether depressive affect in particular is related to spouse criticism both cross-sectionally and over time. But, if
significant lagged effects do emerge, this could substantially bolster both EE and stress generation models.

1.8 Does Lack of Support Lead to Depression?

1.8.1 Partner effects. Support is a key function of social relationships and is a primary way that marriage can lead to good health and can buffer against life stressors (Coombs, 1991; Cutrona, 1996). In the marital discord model, spousal support, along with spousal criticism, is offered as one of the key independent pathways through which marital discord leads to depression (Beach et al., 1990). Empirically, there is evidence that lack of support in marriage is associated with depressive symptoms cross-sectionally (Dehle, Larsen, & Landers, 2001). Also, those who have support, especially from spouses, are less likely to become depressed over time (Brown & Harris, 1978; Jacobson, Fruzetti, Dobson, Whisman, & Hops, 1993; Monroe, Bromet, Connell, & Steiner, 1986). Even on a daily level, spouse support predicts negative affect (Feldman et al., 1999; DeLongis, Capreol, Holtzman, O’Brien, & Campbell, 2004). For example, in a diary study of 83 community couples, DeLongis and colleagues (2004) found that both perceived spouse support and spouse strain (e.g., criticism or disappointing spouses) independently contributed to current negative affect (albeit in the opposite direction). However, only lack of spouse support during the previous day predicted negative affect the next day (DeLongis et al., 2004). Therefore this suggests that at least in community couples, spouse support measured on a daily level can lead to less negative affect across days.
Despite this strong evidence and the general intuitive appeal of the model, additional empirical results (Gable, Reis, & Downey, 2003; Gleason, Iida, Shrout, & Bolger, 2008; Uehara, 1995) and theory (Walster, Berscheid, & Walster, 1973) caution against assuming that all support is positive and leads to decreases in negative affect. For example, according to equity theory (Walster et al., 1973), receiving social support may lead to negative outcomes when the amount of support received is not equal to the support one provides or if one benefits excessively from the support they have received. Adding evidence to this theory, Gleason and colleagues (2008) found that in couples preparing to take the bar exam, receiving support was associated with more negative mood when the partner being assessed did not provide support. Thus, in couples, evidence is mixed for the relation between increased social support and resulting affect, with research suggesting that results may depend on the broader context in which support is received.

Placing support in its context and turning to the effects of support specifically in samples of pain patients may be important. In pain patients, support has both positive and negative effects. Social support receipt can have many positive effects on health and adjustment, such as encouraging better coping and psychological health (Stanton, Revenson, & Tennen, 2007). However, social support can also have negative effects. For example, although relations have been mixed, there is some evidence that social support is associated with increased pain (Flor et al., 1987; Kerns et al., 1990; Kerns et al., 1991). On the other hand, a number of studies more consistently indicate that social support is directly related to less depressive symptoms (e.g., Lopez, Esteve-Zarazaga, Ramirez-Maestre, 2008; van Lankveld, Teunissen, Naring, Vonk, van den Hoogen, 2008).
However, most of these studies have been cross-sectional and do not examine the temporal or causal nature of the relation between social support and depression. One longitudinal diary study of reflex sympathetic dystrophy syndrome showed that the previous day’s social support predicted less depressed and angry mood but not anxiety the following day (Feldman et al., 1999). In addition to this main effect, social support also moderated the relationship between pain and mood such that, on days when patients experienced more pain, the relationship between depressed mood and support was especially strong (Feldman et al., 1999). For pain patients in particular, social support may constitute strong protection against the detrimental impact of pain on mood (Feldman et al., 1999). In sum, there appears to be more evidence for the relationship between depressive outcomes and social support than there is between other indicators of adjustment (such as pain intensity or anxiety) and support.

1.8.2 Actor effects. While most studies of support have focused on the effects of receiving support, little attention has been paid to the effects of providing support, either when it is given by patients or spouses. Providing support may enhance mood because it makes people feel like useful contributors to relationships (Iida, Seidman, Shrout, Fujita, & Bolger, 2008). Especially in the context of couples with chronic illnesses, and in keeping with equity theory (Walster et al., 1973), providing support may be an important way for patients to equalize the support provision/support receipt ratio. Therefore, to the extent that patients can provide support for partners, their mood may become more positive and less negative. However, at this time, we can only speculate about support provision’s relation to mood as there have been few studies that have actually investigated support provision. One study (Bolger, Zuckerman, & Kessler, 2000) does
suggest that providing support may lead to enhanced mood. In this study, when students preparing for the bar exam provided support to spouses, they experienced improvements in their mood, leading the authors to suggest that perhaps giving support makes people feel more needed (Bolger et al., 2000; Gleason et al., 2008). In any case, these authors recommend more research be conducted on the benefits of providing support.

It would be unwise however, to assume that providing support is always beneficial. Support provision may lead to mood deterioration, especially for spouses of patients. For example, for those who are continually asked to provide support, such as in the case of spouses of patients with chronic illness, providing support may further deplete resources, leading to more negative mood (Revenson, 1994). Likewise, support provision may breed resentment and contribute to negative affect to the extent that support provision is not reciprocated and creates further inequalities in the support provision-support receipt ratio (Revenson, 1994; Walster et al., 1973). Finally, to the extent that providing support does not seem to help or was rejected, spouses may become hopeless that any efforts might help and as a result they may become more dysphoric (Revenson, 1994). The examples above may be especially applicable to spouses who provide support for partners with chronic illness. In all, if providing support to patients does predict negative mood in spouses, support provision may explain caregiver burden effects shown in the literature. Studying the implication of support provision for one’s own mood is important because it will help us understand the costs and benefits of providing support.
1.9 Does Depression Lead to Lack of Support?

1.9.1 Partner effects. Depression is a “soft” or “pro-social” emotion that theoretically signals the need for relationship repair (Sanford, 2007). In this sense, depression may alert partners to become aware of relational problems and to motivate them to provide support for, or show interest in, helping either spouses or the relationship. However, other theories from the stress generation literature posit that depression may actually distance possible supporters and therefore may actually decrease the amount of support that others provide (Davila et al., 1997; Beach et al., 1990). Reflecting these direct conflicts between different theories, empirical studies have also shown opposing results even within the same study. For example, Pasch, Bradbury, and Davila (1997) tested whether spouses high in negative affect would have partners who provided less positive supportive behavior in laboratory interactions. They found that when wives had more depressive symptoms, their husbands provided less positive support, specifically less emotional and other support. However, when husbands had high levels of depressive symptoms, their wives provided more positive emotional support.

In samples of chronic pain patients or those dealing with chronic illness, evidence for depression leading to support is even more mixed than in the case of community couples. Some studies indicate that high levels of depression or psychological distress are related to increased support provision whereas several studies show the opposite relationship, that they are related to decreased support provision (Revenson, 1994). In her review of support and couples coping with chronic illness, Revenson (1994) conjectures that perhaps signs of emotional distress are somewhat more understandable in patients dealing with certain visible stressors such as illness. Such distress is then more likely to
elist support than when such affect is displayed in spouses not experiencing such obvious stressors. At other times, however, depressed affect may indicate poor coping and may thus make spouses less likely to provide support (Revenson, 1994). Especially in the case of CLBP, patients whose disease is often times unexplainable and who might display more chronically depressed affect, partners may not be able to understand why spouses keep experiencing depressed mood or may become hopeless that support will alleviate patient suffering so that they are less likely to provide support in response to such mood (Cutrona, 1996). Whether depressed affect leads to increased or decreased support provision from spouses is ultimately an empirical question. However, if depressed affect leads to decreases in support provision by partners, this may be a way that depression contributes to relational stress and discord.

1.9.2 Actor effects. In addition to either eliciting or stifling support from partners, peoples’ own depressive affect may influence the amount of support given to spouses. Several theories suggest that depression may lead to decreased support of spouses and that this is a way that depressed people may actively generate relational discord (Davila et al., 1997; Gotlib & Beach, 1995). For example, a central concept of marital discord models of depression is that depressed people offer decreased coping assistance and less support for partners (Gotlib & Beach, 1995). Therefore, depression may have a stress generating effect leading to discord and decreased support (Gotlib & Beach, 1995).

Depressive symptoms are associated with many factors that would seem to hinder the amount of support people with depression might provide (Davila et al., 1997; Gotlib & Beach, 1995; Iida et al., 2008). For example, depression is associated with focusing on oneself (Jacobson & Anderson, 1982) and with being less responsive to partners.
(Youngren & Lewinsohn, 1980). Focusing on the self rather than others, and paying less attention to partners, may thus make support provision less likely in that depressed partners may not realize spouses need support (Iida et al., 2008). In addition, depression may be related to low levels of support provision because of the negative views that people with depression hold about the world, themselves, and their spouses (Gotlib & Beach, 1995). Depressive affect might lead people to see partners as more negative or to misinterpret partner behavior, thus decreasing the likelihood of support provision (Cutrona, 1996).

Indeed, depressed mood has predicted the amount of support provided by partners in observationally coded marital interactions (Cutrona & Suhr, 1994; Davila et al., 1997; Pasch et al., 1997). In one study, wives’ but not husbands’ initial depressive symptoms inversely predicted support provision even while controlling for general marital stress (Davila et al., 1997). However, in a daily process study of couples without a depression or chronic illness, there was no indication that negative affect resulted in subsequent changes in support provision, but increases in positive mood did predict increased support provision (Iida et al., 2008). Therefore, current evidence suggests that depressed mood leads to decreased support provision, however this question has not been adequately investigated in a daily process design in couples facing chronic illness or depression.

1.10 Inclusion of Multiple Forms of Affect

While the primary focus of this study was on associations between depressed affect and both spousal criticism and support, we also included other types of affect
(anger, anxiety, and positive affect) that have been implicated in chronic pain, depression, and marital discord (Gatchel et al., 2007; Leonard et al., 2006). Investigation into these forms of affect and their relation to pain and marital functioning has been recommended by Leonard and colleagues (2006) in their recent review of the topic. Other investigators also call attention to the need to explore positive indicators of adjustment to chronic illness, including positive affect (Stanton et al., 2007). Positive affect has been generally ignored in the literature. However, it may be important to distinguish between different facets of affect and to include positive affect as it might have specific correlates (Clark & Watson, 1991; Tan, Jensen, Thornby, & Sloan, 2008).

1.10.1 Anger. In the current study, anger was included because chronic pain patients have been shown to have high levels of anger and hostility, and anger is a highly salient predictor of adjustment in pain (Fernandez & Turk, 1995). In fact, anger has been linked with symptom specific pain in CLBP (Burns, 1997; Burns, 2006). Therefore, anger may be especially salient in the context of a chronic pain sample.

In addition to its association with pain, we examined anger because it is also theoretically related to emitting and responding to criticism (Smith & Lazarus, 1990). Theoretically, anger may be related to responding to criticism because anger’s function is to remove harm or threat (Smith & Lazarus, 1990). Since criticism is often harmful or threatening, anger may be a defensive reaction against the threat that criticism represents. Empirical work adds support for this conjecture. “Hard emotion” (e.g., anger) has been associated with increases in subsequent negative communication such as defensiveness and criticism (Sanford, 2007). In this regard, anger may be a defensive response to threat.
Regardless if anger is a response to criticism, this at least suggests that anger is associated with emitting criticism.

Anger may also provoke criticism from spouses. In fact there are recent indications that anger in patients may be a particularly strong elicitor of spousal criticism. Out of all symptoms of post traumatic stress disorder, relatives view patient irritability and anger as the most controllable symptom, and they are more likely to criticize patient anger than any other symptom (Barrowclough, Gregg, & Tarrier, 2007). In samples of pain patients, expressed anger has also been strongly correlated with perceived spousal criticism and punishing responses (Burns, Johnson, Mahoney, Devine, & Pawl, 1996). Finally, not only may it elicit criticism from spouses, spousal anger might also discourage spouses from acting in supportive or comforting ways (Lane & Hobfoll, 1992; Schwartz et al., 1991). In sum, these studies document anger’s role as an important emotion expressed in interpersonal interactions.

1.10.2 Anxiety. Like anger, anxiety has also played a role in chronic pain (Roy-Byrne et al., 2008). In a representative sample, chronic pain was more strongly associated with anxiety than with depression, with 12-month prevalence rates of anxiety disorders at 35.1% and rates for mood disorders at 21.7% (McWilliams, Cox, & Enns, 2003).

In addition to its association with pain, anxiety is also associated with marital interactions, including spousal criticism in such interactions. Several studies indicate that spousal criticism may account for anxiety in those with anxiety disorders as well as with chronic pain. For example, in EE studies involving anxiety patients, relatives’ criticism is related to worse treatment response (Chambless & Steketee, 1999; Renshaw, Chambless, & Steketee, 2003). In studies of pain patients, negative spousal responses to pain
behavior (e.g., expressing irritation) uniquely predict anxiety symptoms (Cano, Gillis, Heinz, Geisser, & Foran, 2004). In a manner similar to negative spousal responses, criticism may also uniquely account for patient anxiety.

Social support may also account for some aspects of patient anxiety. In fact, in the context of chronic pain and those facing specific stressors, anxiety has most often been studied in relation to spousal support rather than to spousal criticism. Cross sectional studies have demonstrated robust relations between social support and anxiety in various clinical contexts including adjustment to illness and medical procedures (e.g., Krohne & Slangen, 2005). Longitudinally, however, there is mixed evidence for the relation between anxiety and support in part because the relationship may depend on the nature of the stressors that couples are facing or the sample used. For example, in a sample of patients who experienced a myocardial infarction, those who experienced infrequent social interactions and more loneliness had worsening anxiety over the course of the year (Murphy et al., 2008). In pain samples however, there has not been the same degree of relation between anxiety and support. Feldman and colleagues (1999) found that for 109 patients with chronic reflex dystrophy syndrome, perceived support predicted decreases in next day depression and anger, but not anxiety. They concluded that perhaps effects were not found for anxiety because the impact of social support on anxiety applies specifically to pain related anxiety not to anxiety in general (Feldman et al., 1999). Besides not finding significant connections between support and anxiety, evidence from a study of couples preparing for the bar exam indicates that actual support receipt may increase anxiety on the next day, especially in stressful periods. The authors of this study conjecture that because it may draw attention to the support receivers’ negative mood or
challenging life circumstances, some support might lead to a “spiral of negativity” (Bolger et al., 2000, p. 959).

1.10.3 Positive affect. Traditionally, negative affect has been the focus of research regarding marital interactions in part because of the consistent and robust associations between negative affect and the negative behavior displayed during marital conflict. Positive affect however, may also be related to behavior in interactions and reactions to such behavior. Indeed, positive affect has been shown to play a significant role in patient functioning and response to daily events (Steptoe, O'Donnell, Marmot, & Wardle, 2008; Zautra, Affleck, Tennen, Reich, & Davis, 2005). Specifically, Zautra and colleagues (2005) have found that positive affect in RA patients is linked to positive events and that both negative and positive affect play roles in relation to negative daily events. In a large scale cross-sectional epidemiological study, positive affect predicted greater support and better coping responses, such as eliciting support and problem solving (Steptoe et al., 2008). Likewise, in a study of couples whose wives were undergoing in-vitro fertilization treatment, support provision from husbands to wives was related to men’s increased positive affect after the treatment (Knoll, Kienle, Bauer, Pfüller, & Luszczynska, 2007). Therefore, positive affect may be a strong predictor or consequence of positive events. Answers to such questions about positive affect remain open to study as they have generally been ignored until now (Delongis et al., 2004). However, recent work calls attention to the increasing need to delve into factors, such as spousal support, that can lead to increased patient adjustment, including increased positive affect (Stanton et al., 2007).
1.11 Overview of the Study and Hypotheses

Our main questions concerned concurrent and lagged relations between depressed affect and both criticism and support. We studied these associations within a relational framework using an APIM model (Figures 1 and 2). Two models in each case were run, one corresponding roughly to a diathesis-stress conceptualization and one corresponding roughly to a stress generation conceptualization. Although the models do not correspond exactly to diathesis-stress and stress generation conceptualizations, we use these terms in order to distinguish between the directions of the relationships in each model. A diathesis-stress conceptualization (Figure 1) refers to when behavior (e.g., criticism or support) predicts depressed affect. A stress generation conceptualization (Figure 2) refers to when depressed affect predicts behavior (e.g., criticism or support). In all, there were eight models, four for concurrent associations (two for the relationship between criticism and depressed affect and two for the relationship between support and depressed affect) and four for lagged associations. Additional exploratory models using the APIM were also conducted for anger, anxiety, and positive affect in relation to both criticism and support.

In regards to the main hypotheses, we predicted in the concurrent models, actor and partner effects of the relationship between both criticism and support and depressed affect would be significant. In essence, when patients and spouses are either being critical or being criticized or are giving or receiving less support, both patients and spouses will also be experiencing more depressed affect. In regards to lagged effects for the criticism and depression analyses, we hypothesized only the partner effects in the diathesis-stress model would be significant. In other words we predicted criticism would predict later
depressed affect in the partner receiving the criticism. We also expected the actor effect in the stress generation model to be significant. This indicates that depressed affect leads to later criticism of partners. For analyses involving social support, like criticism, we predicted all concurrent associations would be significant. Also, we predicted the same lagged effects that emerged for criticism would also emerge for social support. That is, the partner effect in the diathesis-stress model would be significant as well as the actor effect in the stress generation model. Thus, we hypothesized support would predict later depressed affect in partners (a cross-spouses effect) and depressed affect would predict later support provision (a within-person effect)
CHAPTER 2:

METHOD

2.1 Participants

Participants were recruited from areas surrounding the University of Notre Dame Marital Therapy and Research Clinic, Rush University Medical School, and Duke University. Our primary recruitment sources were physician referrals as well as pamphlets and banners placed at the Rehabilitation Institute of Chicago, Pain and Rehabilitation Center of Chicago, Duke Medical Center Pain Clinic, and the Memorial Hospital Pain Control Center in South Bend, IN. These were our primary recruitment sources because we preferred to include patients who we know already have a clinical diagnosis of CLBP. However, we also recruited by advertisements placed in local newspapers to obtain additional participants and to increase the diversity of the sample. Only participants with clear evidence of CLBP were included in the study.

In addition to having a CLBP diagnosis, participants also had to meet several other inclusion criteria as determined via a phone screen before they were invited to participate. The first of these criteria concerned the pain symptoms experienced by the patient. Pain must have been “chronic”, meaning that for at least 6 months after doctors judged that pain normally should have subsided, pain must have continued to be experienced on a daily basis. Pain also must have been an average intensity of at least a “3” out of “10” on a scale with anchors of “0” (no pain) and “10” (the worst pain
possible). Pain could have stemmed from any of the following sources: musculoskeletal pain of the lower back due to degenerative disk disease, or spinal stenosis; disk herniation; or muscular or ligamentous strain. Conversely, pain patients were excluded if their low back pain was not their primary source of pain (i.e., rated the highest out of all pain conditions).

The next set of inclusion and exclusion criteria pertained to both spouses. Both pain patients and their spouses must have been between 18 and 65 years old. They must have been able to speak and read English at an 8th grade level, which corresponds to the reading level of the study questionnaires. Couples were excluded if either spouse had any of the following: (a) medical conditions putting them at risk from brief, stress-induced physiological arousal; (b) alcohol or substance abuse or dependency within the last year; (c) bipolar disorder; (d) obsessive compulsive disorder or post traumatic stress disorder within the past 2 years; (e) depression of the postpartum subtype; (f) or were acutely suicidal. The presence of psychiatric conditions was assessed using the screening section of the Structured Clinical Interview for DSM-IV Axis I Disorders-Non-Patient Edition (SCID-I/NP, Feb 2001 revision: First, Gibbon, Spitzer, & Williams, 2001).

Apart from these patient and couple inclusion and exclusion criteria, the last inclusion criterion referred specifically to spouses of pain patients. Couples were excluded if the spouse of the patient diagnosed with CLBP reported a condition causing acute pain (e.g., more than six migraine headaches in the past year) or reported a history of at least one chronic pain episode lasting 4 or more months. Thus, only one spouse in the couple was patient diagnosed with CLBP. The other spouse was pain-free.
In the final sample, 105 couples were included (29 from the Notre Dame site, 38 from the Rush site, and 38 from the Duke site). Initially, we recruited 121 couples but eight couples elected not to participate in the diary study; three couples started the diary study but did not finish; four couples had difficulties with their PDAs malfunctioning and therefore their data had to be excluded; and one couple’s data was lost due to failure to upload it at an appropriate time from the PDA. Couples whose data were not included in this investigation did not differ significantly on most demographic variables from those who were included in the study. The only significant difference in the demographic variables between these two groups was that for couples who were included, significantly more spouses were unemployed, students, or retired versus having full or part time jobs, \( t(116) = -2.16, p = .03 \). Table 1 shows the overall demographic information for the combined sample. Paired samples t-tests indicated that patients and spouses were similar on most of the demographic variables. However, patients were significantly more likely than spouses to have a history of past depression, \( t(100) = -2.47, p = .02 \). Spouses however were significantly more likely than patients to be employed (either full or part time), \( t(99) = 3.12, p = .002 \).

2.2 Procedure

We recruited married couples as part of a larger investigation, “Spousal Expression of Criticism/Hostility and Adjustment among Chronic Pain Patients” (NIH/NINR 1R01NR010777-01). Participants meeting study criteria (as described in the Participants section) were invited to either the diary study or to first complete the laboratory part of the larger study if they qualified. It is important to note that participants
TABLE 1

DESCRIPTIVE STATISTICS DESCRIBING PATIENT AND SPOUSE DEMOGRAPHIC CHARACTERISTICS

<table>
<thead>
<tr>
<th></th>
<th>Patient</th>
<th>Spouse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender (% female)</td>
<td>48.60</td>
<td>51.40</td>
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<tr>
<td>Age in years ($M, SD$)</td>
<td>46.30 (12.07)</td>
<td>45.96 (13.21)</td>
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<tr>
<td>Ethnicity (% Hispanic)</td>
<td>4.80</td>
<td>5.70</td>
</tr>
<tr>
<td>Race (% Asian, African</td>
<td>1.00, 18.10, 80.00</td>
<td>1.00, 18.10, 81.00</td>
</tr>
<tr>
<td>American, Caucasian)</td>
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<td></td>
</tr>
<tr>
<td>Employment (% employed,</td>
<td>40.00, 38.10, 3.80, 13.30</td>
<td>63.80, 17.10, 4.80, 13.30</td>
</tr>
<tr>
<td>employed, unemployed,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>student, retired)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years with pain ($M, SD$)</td>
<td>9.04 (7.82)</td>
<td>---</td>
</tr>
<tr>
<td>History of major</td>
<td>23.80</td>
<td>8.60</td>
</tr>
<tr>
<td>depression (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>History of anxiety (%)</td>
<td>18.10</td>
<td>11.40</td>
</tr>
</tbody>
</table>
may not have been invited to participate in the laboratory study if they took medication for high blood pressure but this did not preclude them from participating in the diary portion of the study. For the laboratory study, each spouse received $75 remuneration. Couples who completed the laboratory study were then recruited to participate in the diary study. Each spouse received $150 for the diary phase of the study.

2.2.1 Part 1: Laboratory sessions. Although information from the laboratory sessions was not included in this study, it is important to note that most spouses participated in the laboratory session before participating in the diary portion of the study from which the data from the current study are drawn. In the laboratory sessions, both spouses jointly attended two laboratory sessions spaced 7 to 10 days apart. During these sessions, spouses engaged in videotaped discussions with each other and completed a Structured Pain Behavior Task. During this task, pain patients performed everyday activities (e.g., sitting, standing, walking) that produced mild to no pain while their spouse observed. Finally, both CLBP patients and spouses also independently completed a variety of standard self-report questionnaires assessing marital adjustment, personality, depressive symptoms, and adjustment to CLBP. These assessments were not used in this dissertation study.

2.2.2 Part 2: Electronic daily diaries. Patients and spouses each used their own customized personal data assistant (PDA) to complete diary assessments five times per day for 14 consecutive days. Before this 14-day period, participants attended a laboratory visit (either at the end of their second visit in part 1 of the study or as a separate visit if they did not complete part 1 of the study) at which time they were given detailed instructions on how to use the PDA. Terms used in the PDA assessments were defined
for participants. Participants were given printed copies of instructions for reference and were encouraged to call research assistants at any time with any questions or PDA problems to prevent data loss. Likewise, the study rationale and the impact that missing assessments could have on the conclusions drawn from the study were explained. In previous studies, these procedures have successfully increased participant compliance and motivation to participate (Green et al., 2006). After it was clear that participants understood how to use the PDA and were able to complete demonstration questions on a practice PDA, they were each given a PDA to take home with them. At the end of 14 days, participants returned the PDAs, were paid $150 each, and were debriefed.

Palm® Zire 22 PDAs running the Palm OS platform were used. PDAs were programmed using the Experience Sampling Program (ESP; Barrett & Feldman Barrett, 2000). Each PDA was given a unique ID number for the couple and a unique patient or spouse ID so that each participant’s data was stored as a unique file for each individual participant. We also “took over” the PDAs so that participants could not use the devices for other purposes during the 14 days of assessment. During the day, participants carried the PDAs with them and completed assessments when signaled. Each night they charged the PDAs via a charger that was provided for them. Participants were encouraged to contact study investigators immediately if PDAs were not emitting signals or if they lost PDAs so that investigators could fix the problem with PDAs over the phone or schedule a time to replace PDAs.

During the course of the two weeks, PDAs emitted an auditory signal prompting participants to complete assessments. Five signals a day were emitted. Each was spaced 3 hours apart with the first signal occurring at 8:50 am and subsequently at 11:50 am, 2:50
pm, 5:50 pm, and 8:50 pm. Interval contingent signaling such as this was deemed appropriate for frequently occurring events such as spousal discussions because it was likely that spouses would have discussions to report during these intervals. The potential drawback of this method, in comparison to event contingent responding, is that there was some chance that participants may exhibit memory biases. These biases may occur because participants were asked to report about mood and interactions with spouses over the past 3 hours in contrast with reporting about mood more frequently, such as directly after interactions with spouses. However, we decided memory biases for reporting over the past 3 hours would likely be minimal. The alternatives of either having participants complete assessments after every interaction with spouses or of being randomly signaled more frequently throughout the day were deemed too burdensome for participants. Therefore we chose to use signal contingent sampling at fixed intervals to enable participants to anticipate assessments and to minimize memory biases without producing any undue burden on participants.

After the initial signal, participants were given 15 minutes to respond. PDAs emitted alarm signals every 30 seconds for 15 minutes until participants responded. This 15 minute time frame to answer was thought to ease participant burden because it gave participants some flexibility over when to complete assessments. For example, it allowed them to complete assessments once they had finished talking on the phone, eating, or driving to a destination. In addition, to further minimize burden or disruption to participants, we gave participants the option of silencing the alarm by simply tapping the PDA screen. This way, if participants were in a place where it was not appropriate for the alarm to go off, such as during a meeting, they could silence PDAs so they were less
disruptive. Silencing PDAs did not interfere with the timing of the assessments. In other words, participants had 15 minutes from the initial signal to respond, however, the alarm did not signal them every 30 seconds to do so.

During assessments, a single question at a time was presented on screen. A stylus was used to check boxes corresponding to the desired answer. Every effort was made to limit the amount of questions participants completed and to make responding as easy as possible. For instance, branching algorithms were used so that if participants did not have an interaction with spouses during a certain time interval, they could skip over questions. While there was some risk that participants indicated having had no interaction in order to skip future questions, we felt we had built enough rapport by this part in the study to have encouraged participants to participate appropriately. Finally, there were only eight brief questions regarding spousal interactions so there was little incentive to avoid them.

After each question was answered, it was time-stamped. After all questions were answered, the total assessment itself was also time-stamped. Time-stamped entries allowed us to monitor participant responses and missing data. Studies have shown that time stamped entries are critical to obtaining un-biased responses. Failure to use them may result in retrospective reporting, even though participants may report that responses were completed on time (Stone, Shiffman, Schwartz, Brokerick, & Hufford, 2003). In all, using these electronically time-stamped entries were a key methodological improvement over many previous diary studies in this field and enabled us to potentially check for and prevent several methodological issues.

2.2.3 Methodological considerations of diary studies. As shown by our explanation of our decisions to use electronically time-stamped diaries and signal
contingent sampling over a 14 day period, the use of EMA has many methodological considerations to take into account. While designing this study, we attempted to minimize what we felt would be the most serious methodological threats to the validity of our results. The first of these threats is reactivity to assessments (Shiffman et al., 2008). Evidence from several other studies has lead researchers to conclude that there is little evidence to suggest that reactive effects are found in EMA studies unless measurements are taken before behavior are executed or if measurement involves trying to change behavior (Shiffman et al., 2008). Regardless, these authors suggest that researchers be aware of the potential for reactive effects as the literature is not conclusive on when reactivity may occur.

In regards to reactivity in our study in particular, findings from previous EMA studies suggest that the reactivity effect for pain patients completing multiple measurements per day, and the reactivity effect for couples’ reporting marital conflict, may be minimal. For example, several EMA studies have investigated reactivity in the context of pain intensity. When pain ratings were taken 7 times a day for one week, no reactivity was found (Cruise et al., 1996). Reactivity has not been found even when pain ratings are taken up to 12 times daily (Stone, Broderick, Schwartz, Shiffman, Litcher-Kelly, & Calvanese, 2003). In regards to reactivity of spousal reporting of conflict, there is the potential for couples to disagree less frequently over time due to having to report such conflicts. However, a recent study using event-contingent daily diaries over a 14 day period showed that there was no decline in reporting of marital disagreements over this period, suggesting that couples were not reacting to reporting their conflicts (Merrilees, Goeke-Morey, & Cummings, 2008). In addition, there was no change in couples’ marital
conflicts in the lab due to completing such diaries (Merrilees et al., 2008). The only possible reactance effect that emerged was that husbands who completed diaries reported decreases in marital quality over the reporting period. Authors suggest that this trend emerged because husbands began to pay more attention to their conflicts and thus their perceptions of their marital quality declined (Merrilees et al., 2008). In all however, despite this finding there was little evidence for reactivity. In addition to the limited reactance effects found in previous studies, since we were not trying to get subjects to change their behavior or mood but rather monitored it over time, reactivity should have been minimized. Thus we did not expect our results to be impacted by reactivity to completing measurements. To use caution however, we checked for reactance effects by using growth curve analyses to examine the linear trend of responses over the 2 week period. Only patient criticism evidenced a significant linear trend over the reporting period, $F(1,104) = 11.61, p < .001$, suggesting that patients reported being more critical throughout the reporting period. Otherwise, patient and spouse depressed affect, spouse criticism, and patient and spouse support did not have significant linear trends over time.

A second potential methodological concern in daily diary studies is participant burden. In order to minimize burden, we had spouses complete assessments for 14 days and limited assessments to five times per day. Studies involving pain patients have shown that participants can successfully complete daily diaries multiple times a day (up to 12 times) over periods even longer than 7 days (Grant et al., 2002; Peters et al., 2000; Stone et al., 2003). The average diary study involves participants completing assessments for 8 to 12 times a day for 1 to 2 weeks (Christensen et al., 2003). In comparison to the average study, we took a somewhat conservative approach to the amount of assessments we
required of participants by having them complete only five entries per day. Likewise, the use of interval contingent signaling also reduced participant burden in that participants could anticipate when the PDA would signal them to respond. Participants were also given opportunities to delay assessments for 15 minutes. In this sense participants had some control over where they completed assessments. In all, we reduced burden by making assessments less frequent, less intrusive, and as simple as possible. It is worth noting too, that participant feedback about completing the PDA portion of the study was generally positive, at least at as it was reported at this author’s research site.

The third and most serious methodological concern in this study was that the quality of data gleaned from the diaries could be undermined by participant non-compliance and missing data. One drawback of diary methods is the potential for missing data (Bolger et al., 2003). If data are not missing at random, then our analyses would be biased (Shiffman et al., 2008). This would be a serious concern if participants miss diaries for systematic reasons that are unbeknownst to us. One such systematic difference would be that participants miss diaries when they are in more pain. In one study, increased pain intensity was not a reason why participants missed entries (Broderick et al., 2003).

One solution to potential bias is to prevent systematic missing of data entries. Thus, we did everything we could to encourage participants not to miss diary entries. We used three strategies to prevent participants from missing assessments. First, we decreased participant burden by giving participants a 15 minute time frame to respond to prompts. Second, we explained the rationale of the study and the impact of missing data. Third, every effort was made to establish rapport with participants in the initial laboratory
part of the study. Procedures such as explaining study rationale and building rapport with participants have been shown to be critical in increasing compliance with study protocol (Green et al., 2006).

Despite these potential concerns with daily diaries, use of this procedure also has many advantages (see Bolger et al., 2003). First, it allowed us to monitor participants in their naturalistic environment. Second, by taking assessments multiple times a day, we obtained minimally biased ratings of mood and spouse behavior. In addition to these two advantages of daily diaries, there are other advantages to using electronic, in comparison to paper, diaries. Electronic diaries enabled us to time-stamp entries to monitor participant compliance with respect to responding on time. They also permitted us to present questions one at a time with fixed responses, thus preventing missed questions or out of range answers. We also used branching algorithms to decrease participant burden so that spouses did not have to complete questions if they do not apply. Finally, use of electronic diaries facilitated data entry as data was transferred directly from the PDA to a data analysis program. This procedure eliminated the potential for data entry errors that would be otherwise common when entering such quantities of data. Thus while the signal contingent electronic diary method used in the proposed study has several disadvantages, it also has many potential advantages and can greatly enhance the study of micro-analytic processes such as couple interactions and mood in daily life (Keefe & Porter, 2007).

2.3 Diary Self-Report Measures

Traditional measures are often unsuitable for use in repeated diary assessments because they are usually too lengthy and burdensome for participants to complete
multiple times a day (Cranford, Shrout, Iida, Rafaeli, Yip, & Bolger, 2006). Therefore, diary assessments used in the proposed study included a number of customized items based on instruments that have been successfully used in other daily diary studies.

2.3.1 Affect. Patients and spouses completed items derived from the Profile of Mood States-15 (POMS-15; Cranford et al., 2006) to assess affect during the past 3 hours. Specifically, participants responded to questions similar to the following: “During the past 3 hours, how sad were you?” For each question in this 12-item measure, a different mood adjective appears in the stem. Three mood adjectives compose each composite mood scale. The composite scales and their respective mood adjectives are as follows: depression (sad, hopeless, discouraged), anxiety (anxious, on edge, uneasy), anger (angry, irritated, annoyed), and vigor (lively, cheerful, happy). Three of the adjectives in these mood scales have been changed from the original POMS-15. That is, “helpless” has replaced “hopeless”, “irritated” has replaced “resentful”, and “happy” has replaced “vigorous.” Finally, our modified “vigor” scale will be used as our measure of positive affect. This dimension roughly corresponds to the “joviality” scale of positive affect from the Positive and Negative Affect Schedule (Watson & Clark, 1994).

The POMS-15 is a shorter version of a more widely known scale, the Profile of Mood States (POMS; McNair, Lorr, & Droppleman, 1992). It was derived from the POMS specifically for use in dairy studies. The POMS-15 is reliable and is particularly useful for capturing daily change in moods (Cranford, Shrout, Iida, Rafaeli, Yip, & Bolger, 2006). Using a generalizability framework to investigate the psychometric properties of the POMS-15, researchers have found internal consistency of same day
affect to be in the .60 to .84 range and the reliability of systematic change in mood over
days to be in the .62 to .82 range (Cranford et al., 2006).

The psychometric properties of the POMS-15 may not strictly apply to the
measure used in our study however, because we slightly modified the scale. Our version
of the POMS-15 differed in three respects from the version of the POMS-15 validated by
Cranford and colleagues (2006). First, it did not include the “Fatigue” scale because we
had reason to believe fatigue is theoretically important with respect to spousal criticism
and support. Second, on the POMS-15, participants make responses on a 0 (not at all) to
4 (extremely) Likert scale whereas in the current study participants responded on a 9-
point Likert scale with anchors at 0 (not at all), 2 (somewhat), 4 (much), 6 (very much),
and 8 (extremely). We added response options so that the scale would correspond with
the Likert responses that was used to measure other constructs in the diary portion of this
study. We also felt that these added response options would lead to greater variability in
responses and would be more sensitive to differences in affect. Third, participants were
asked to rate their affect in the past 3 hours. In other studies, participants were asked to
report their affect either over the past 24 hours or were asked to report how they felt
when they were completing their entries (e.g., they were asked to rate their affect once in
the morning and once in the evening). Given the shorter duration of time between
assessments in our study, we added more response options to increase sensitivity to fine
grain distinctions between moods throughout the course of the day.

2.3.2 Behavior. Patients and spouses responded to the prompt, “Did you talk with
your spouse in the last 3 hours?” If participants respond affirmatively, they completed
additional items concerning their own and their spouses’ behavior during the past 3
hours. To assess criticism, participants responded to the prompts, “How critical of you was your spouse during the past 3 hours?” and “How critical were you of your spouse during the past 3 hours?” Participants were also asked about degree of hostility present in the past 3 hours as well as “how supportive” their spouse was of them and “how supportive” they were of their spouse. All three of these behaviors were rated on the same 9-point scale as used in the modified POMS-15 scales just described.

Even though we have data on both “actual” and perceived support and criticism, we only used reports of criticism and support from the “actor” (i.e., the one being critical or supportive). In other words, we used spouse reports of their own behavior. The alternative would have been to have spouses report on partner behavior; thus, they would have been reporting perceived behavior. While perceived support and criticism are important phenomena, we chose to focus on “actual” support or criticism for several reasons. First, by using spouse reports of their own behavior we hoped to eliminate systematic biases in reporting that are correlated with affect or other study constructs such as marital adjustment. Reports of perceived criticism have been correlated with depressed affect and marital adjustment (Smith & Peterson, 2008). Thus, we felt that depressive affect, marital adjustment, and other study constructs would not systematically bias reports of actual behavior as much as they would bias reports of perceived spousal behavior.

Second, we felt that using actor reports of behavior may be applicable in predicting both actor and partner affect while partner reports may be useful only for predicting partner affect. Bias in reports of perceived behavior (Smith & Peterson, 2008) may hinder the ability to predict actors’ own mood in comparison to the prediction power
of actor reports of their own behavior. In addition to being a better predictor of actor affect, actor reports of their own behavior have, at times, been more useful in predicting partner reactions to actor behavior than partner reports of perceived actor behavior (Bolger, Zuckerman, & Kessler, 2000). For example, in a daily diary study of spousal support, one-third of spousal behavior reported by one spouse were not reported by the spouse receiving them (Bolger, Zuckerman, & Kessler, 2000). These instances of “invisible support” that were not perceived by partners predicted greater decreases in partner depression in comparison to instances of support that were perceived by partners (Bolger, Zuckerman, Kessler, 2000). In sum, because reports of actor criticism and support predict both actor and partner responses, and because reports given by actors may be less subject to biases originating from constructs under investigation, we relied on actor reports of their own behavior rather than on partner reports of perceived actor behavior.
CHAPTER 3:

RESULTS

3.1 Data Preparation

Data were cleaned so that all answers submitted past the 15 minute response interval were discarded. Following this, 87.1% of patient and 89.1% of spouse records remained. This amount of missing records is in the range typically observed in other electronic diary studies involving pain patients (Sorbi et al., 2006; see Shiffman et al., 2008 for a review).

On the remaining records, patients reported interacting with spouses during 73.2% of intervals, whereas spouses reported interacting with patients during 72.4% of intervals. Patients and spouses had a $\kappa = .70$ (88.4%) level of agreement about speaking to each other during the same 3 hour intervals.

Before conducting APIM analyses of the data, we also examined the means and standard deviations of study variables averaged across the time points (see Table 2). As shown in Table 2, on the 9-point Likert scales, with anchors of 0 (not at all), 2 (somewhat), 4 (much), 6 (very much), and 8 (extremely) patients and spouses were on average just above “not at all” critical of partners during each interval whereas on average they provided just below “much” support on each interval. Comparing the mean affect scores to a total possible score of 24, patients and spouses averaged low levels of
depressed, angry, and anxious affect on each interval whereas they averaged moderate levels of positive affect.

**TABLE 2**  
MEANS AND STANDARD DEVIATIONS OF MAIN STUDY CONSTRUCTS ACROSS TIME POINTS

<table>
<thead>
<tr>
<th>Construct</th>
<th>Patient</th>
<th>Spouse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Criticism</td>
<td>.80 (1.07)***</td>
<td>.45 (.45)</td>
</tr>
<tr>
<td>Support</td>
<td>3.61 (1.73)</td>
<td>3.86 (1.64)</td>
</tr>
<tr>
<td>Depression</td>
<td>3.06 (3.63)***</td>
<td>1.35 (1.88)</td>
</tr>
<tr>
<td>Anger</td>
<td>3.51 (3.59)***</td>
<td>2.12 (2.05)</td>
</tr>
<tr>
<td>Anxiety</td>
<td>3.95 (3.72)***</td>
<td>2.01 (2.12)</td>
</tr>
<tr>
<td>Positive Affect</td>
<td>7.75 (3.48)***</td>
<td>10.84 (4.13)</td>
</tr>
</tbody>
</table>

* *p < .001 for paired samples t-tests of patient and spouse means.
In comparing the means of patients to spouses within each couple, paired samples $t$-tests indicated that the means for patients and spouses differed significantly from each other on most of the main study variables as show in Table 2. That is, patients reported being significantly more critical than their spouses reported themselves to be, $t(104) = 3.36, p < .001$. Patients also reported experiencing significantly more negative affect than their spouses ($t$s = 4.66, 3.73, and 4.84, for depression, anger, and anxiety respectively, and $p$s < .001). In a similar manner, patients reported experiencing less positive affect than their spouses, $t(104) = -6.59, p < .001$.

3.2 Analytic Approach

The standard over-time APIM model (see Figure 1) as described by Kenny et al. (2006, p. 356-359) served as the basis for data analysis. This model takes into account both dyadic non-independence and autocorrelation of scores over time. In addition, the APIM includes both spouses of a couple in the same model so that they can be studied simultaneously. Because both spouses are included in the model, we obtained actor and partner effects (i.e., within- and cross-spouse effects) for both patient and spouse dependent variables (Kenny, Kashy, & Cook, 2006). Therefore all four paths that comprise a dyadic relationship were estimated in our APIM model. In addition, it is important to note that since actor and partner effects are included in each model, estimating actor effects is done while controlling for partner effects and vice versa. This allowed us to control for the effects of one’s spouse’s behavior or affect in order to get a more accurate estimate of the unique contribution of each spouses’ independent variable to each spouses’ dependent variable.
There are two main types of APIM models, one for “distinguishable” dyads and one for “indistinguishable” dyads (Kenny et al., 2006). We used the APIM model for distinguishable dyads because members of the couple were classifiable non-arbitrarily by their status as either “patient” or “spouse” (the non-patient participant). Throughout this manuscript we refer to members of the couple accordingly.

The APIM for distinguishable dyads was estimated using multilevel modeling (MLM) with SAS PROC MIXED. As noted by Kenny et al. (2006), the specific model used in our analyses is appropriate for modeling both dyadic non-independence and the autocorrelation between Y variables. By using a first-order autoregressive error structure, TYPE = UN@AR(1), we modeled the autocorrelation of the errors, to account for dependency in the dependent variables over time.

For each APIM model, we tested both concurrent and lagged-effects. The two concurrent models captured the extent to which, over the same 3 hour period, (1) actor and partner behavior were related to actor affect at the same time point (diathesis-stress model); and (2) how actor and partner affect were related to actor behavior at the same time point (stress generation model). The two lagged models captured the extent to which, (1) actor and partner behavior at predicted actor affect in the subsequent 3 hours (diathesis-stress model); and (2) actor and partner affect predicted actor behavior in the subsequent 3 hours (stress generation model).

Level 1 of the diathesis-stress form of the concurrent model (i.e., all variables are measured at the same time point) is represented as:
Level 1:

\[ Y_{pc} = \beta_{1pc} \text{(Person)} + \beta_{2pc} \text{(Actor_Criticism*Person)} + \beta_{3pc} \]
\[ \text{(Partner_Criticism*Person)} + \beta_{4pc} \text{(Trial_ID)} + r_{pc}, \]

where \( p \) stands for the person (patient or spouse), \( c \) stands for the “\( c \)”th couple, and \( t \) stands for the “\( t \)”th time point. \( Y \) is the dependent variable (DV), which in this instance is actor depressed affect.

Level 2 of the diathesis-stress form of the concurrent model is represented as:

Level 2:

\[ \beta_{1c} = \gamma_{10} + \mu_{1c} \]
\[ \beta_{2c} = \gamma_{20} + \mu_{2c} \]
\[ \beta_{3c} = \gamma_{30} + \mu_{3c} \]
\[ \beta_{4c} = \gamma_{40} \]

with the random effects, \( \mu \)’s, for person as well as actor and partner effects were specified to be uncorrelated using the type = VC command because models would not converge with correlated random effects (i.e., type = UN) (see Fitzmaurice, Laird, & Ware, 2004, p. 231). The error structure for person and trial were specified as first-order autoregressive as noted above.

In this study, there were 140 records per couple for couples having complete data (5 records a day x 14 days x 2 spouses). The 2 records at each time point corresponded to when the patient DV was used as the outcome variable and when the spouse DV was used as the outcome variable.

“Person” is a dummy variable that was coded -1 if the patient was the actor (i.e., if the DV was from the patient) and +1 if the spouse was the actor (i.e., if the DV was
from the spouse). “Trial_ID” represents the linear effect of time.

“Actor_Criticism*Person” is the actor effect. There is one actor effect for the patient (path $a$ in Figure 1), which represents the relationship between patient criticism and patient depressed affect when the patient outcome is the DV. There is also one actor effect for the spouse (path $b$ in Figure 1), which represents the relationship between spouse criticism and spouse depressed affect when the spouse outcome is the DV.

“Partner_Criticism*Patient” indicates the partner paths when either the patient is the partner (path $c$ in Figure 1) or the spouse is the partner (pathway $d$ in Figure 1).

Therefore, path $c$ refers to the association between patient criticism and spouse depressed affect (patient partner effect) whereas path $d$ refers to the association between spouse criticism and patient depressed affect (spouse partner effect). In sum, for any one DV, there is one intercept ($\beta_1$), one actor term ($\beta_2$), one partner term ($\beta_3$), and one term for the linear effect of time ($\beta_4$). Whether the intercept, actor term, and partner term is for the patient or the spouse depends on whether the DV is from the patient or the spouse.

Separate intercepts, actor terms, and partner terms are estimated for the patient and spouse in each couple.

Each of the level-1 parameters described above ($\beta$’s) are comprised of both fixed and random components that are then modeled in level-2 equations. $\gamma$’s represent fixed effects or average population parameters. $\mu$’s represent random effects or average variability in population parameters. In other words, the random effects capture between-couples variance or, how each couple uniquely varies from the average population parameter. Following this logic, $\gamma_{10}$, represents the average intercept for patients and spouses averaging over all couples and all time points. In other words, it reflects the
average amount of patient and spouse depressed affect when there is no criticism (i.e., when the rest of the predictor variables have values of zero). The corresponding random effect, $\mu_{1c}$ represents the variability in affect from couple to couple when there is no criticism (i.e., the between-couples variability in patient intercepts). The fixed effect of Actor_Crit*Patient, $\gamma_{20}$, is the average slope relating actor criticism to actor affect. $\mu_{3c}$ is the average variability from couple to couple for this same variable. The rest of the parameters follow a similar pattern. It is important to note, however, that Trial_ID does not have a corresponding random effect. Instead, the error structure is specified as a first-order autoregressive structure. This, combined with a first-order autoregressive structure for the “Person” variable captures the dependency in the DV over time.

In creating this model, variables were not centered because zero is a meaningful value on all scales. It corresponds to the absence of criticism, support, or affect at that time point. Furthermore, it is important to note that the lagged models were identical to the concurrent model presented above except that the actor and partner effects were from the lagged time point that occurred 3 hours before the DV was assessed (i.e., $t-1$).

3.3 Results for Concurrent Models of Depressed Affect and Behavior

3.3.1 Concurrent diathesis-stress model of criticism and depressed affect. The concurrent diathesis-stress model did not converge when either the unstructured or variance components error structure was used. When the random effects for the actor and partner terms were removed, the model did converge with a variance components error structure. In this model, all actor and partner effects were significant as hypothesized (see Figure 3). In other words, patient criticism was significantly positively associated with
patient depressed affect, $b = .31, SE_b = .04, t(3904) = 8.80, p = .001$, even when controlling for spouse criticism of patients. In a similar way, spouse criticism was significantly positively associated with spouse depressed affect, $b = .69, SE_b = .03, t(3436) = 20.11, p < .001$, while controlling for patient criticism. In addition to finding all actor effects were significant, we also found that all partner effects were significant. That is, patient criticism was significantly positively associated with spouse depressed affect, $b = .11, SE_b = .03, t(3809) = 4.08, p < .001$, even when controlling for spouse criticism. In a similar manner, spouse criticism was significantly positively associated with patient depressed affect, $b = .25, SE_b = .05, t(3911) = 5.67, p < .001$, even when controlling for patient criticism. In sum, all within- and cross-spouse associations between criticism and depressed affect were significant such that the more critical patients and spouses were, the more depressed both patients and spouses were.

![Figure 3: A concurrent diathesis-stress model of criticism and depressed affect. Note that black paths are significant.](image)
3.3.2 Concurrent stress generation model of depressed affect and criticism. The concurrent stress generation model shown in Figure 4 converged with both actor and partner random effects and a variance components error structure. Identical to the diathesis-stress model presented in section 3.2.1, in the stress generation model where actor and partner depressed affect were the IVs and criticism was the DV, all actor and partner effects were significant as hypothesized (see Figure 4). In other words, patient depressed affect was significantly positively associated with patient criticism, $b = .08, SE_b = .01, t(123) = 5.53, p < .001$ even when controlling for spouse depressed affect. In a similar way, spouse depressed affect was significantly positively associated with spouse criticism, $b = .12, SE_b = .01, t(132) = 8.14, p < .001$ even when controlling for patient depressed affect. In addition to these significant actor effects, all partner effects were significant as well. That is patient depressed affect was significantly positively associated with spouse criticism, $b = .02, SE_b = .01, t(55.4) = 2.95, p < .01$ while controlling for spouse depressed affect. In a similar manner, spouse depressed affect was associated with patient criticism, $b = .05, SE_b = .01, t(101)= 5.40, p < .001$ even while controlling for patient depressed affect. In sum, all within- and cross-spouse associations between depressed affect and criticism were significant such that the more critical patients and spouses were, the more depressed both patients and spouses were.
3.3.3 Concurrent diathesis-stress model of support and depressed affect. Contrary to our hypothesis, and unlike the concurrent diathesis-stress model for criticism and depressed affect (see section 3.3.1), concurrent actor and partner support were not always significantly associated with depressed affect at the same time point (see Figure 5). There was a significant negative relationship between patient support and patient depressed affect (patient actor effect), $b = -.08, SE_b = .04, t(263) = -2.16, p = .03$, even while controlling for spouse support. This indicated that higher levels of patient support were associated with lower levels of patient depressed affect. There was also a significant negative association between patient support and spouse depressed affect (i.e., patient actor effect), $b = -.06, SE_b = .03, t(119) = -2.36, p = .02$, even while controlling for spouse support. This indicated that higher levels of support given by patients were associated with lower levels of spousal depressed affect. Finally, the path for the significant negative association between spouse support and spouse depressed affect approached significance, $b = -.06, SE_b = .03, t(194) = -1.81, p = .07$. Contrary to our hypothesis, there was not a significant association between spouse support and patient
depressed mood, $b = .02$, $SE_b = .03$, $t(224) = .70$, $p = .48$. Therefore, it appears that patient support rather than spouse support is inversely associated with both patient and spouse depressed affect.

Figure 5: A concurrent diathesis-stress model of support and depressed affect. Black paths are significant. Dashed paths are marginally significant. Paths not shown were not significant.

3.3.4 Concurrent stress generation model of depressed affect and support.

Contrary to our hypothesis, not all associations between depressed affect and support at the same time point were significant. Significant actor and partner effects emerged only for associations between spouse depressed affect and spouse support while controlling for patient depressed affect. That is, spouse depression was significantly negatively related to spouse support, $b = -.07$, $SE_b = .02$, $t(117) = -3.68$, $p < .001$, such that the more depressed spouses felt, the less support they provided to patients. In addition, spouse depressed affect was significantly negatively associated with patient support, $b = -.03$, $SE_b = .02$, $t(48) = -2.24$, $p = .03$, such that the more depressed spouses felt, the less patients provided them with support. Turning to relations with patient depressed affect, no significant actor or partner effects emerged. That is, patient depressed affect was not
significantly associated with patient support while controlling for spouse depression, \( b = -0.02, SE_b = 0.02, t(88.5) = -1.10, p = 0.275 \). Nor was patient depressed affect significantly related to spouse support of patients, \( b = 0.01, SE_b = 0.01, t(48.3) = 0.68, p = 0.50 \), while controlling for spouse depressed affect. In sum, it appears that only spouse depressed affect is significantly associated with the amount of support provided by both patients and spouses.

![Figure 6: A concurrent stress generation model of depressed affect and support. Black paths are significant. Paths not shown were not significant.](image)

3.4 Results for Lagged Models of Depressed Affect and Behavior

3.4.1 Lagged diathesis-stress model of criticism and depressed affect. To test a diathesis-stress model to see whether patient and spouse criticism predicted patient and spouse depressed affect in the subsequent 3 hours, we ran a lagged actor-partner model identical to the concurrent model, but with one change- the predictor variables were from the lagged time point that occurred three hours prior. Therefore, actor and partner criticism at time \( t-1 \) predicted depressed affect in the subsequent 3 hours as rated at time \( t \) with an autoregressive error structure for the DV to represent dependency in the DV over time. In this model we hypothesized that we would find significant partner or cross-
spouse effects for associations between criticism and depressed affect. As can be seen in
Figure 7, this hypothesis was partially supported in that the partner effect for spouses
neared significance, $b = .09, SE_b = .05, t(216) = 1.85, p = .06$, such that the more critical
spouses were of patients, the more depressed patients felt in the subsequent 3 hours. We
did not however find a corresponding partner effect for patient criticism, $b = -.04, SE_b =
.03, t(86) = -1.27, p = .21$. In addition, contrary to our expectations we also found a
significant actor or within-person effect according to which spouse criticism of patients
significantly predicted spouse depressed affect in the subsequent 3 hours, $b = .14, SE_b =
.05, t(161) = 2.59, p = .01$. That is, the more critical spouses were of patients, the more
depressed spouses felt in the subsequent 3 hours. In contrast to this significant actor
effect for spouse criticism, the actor effect for patient criticism was not significant, $b =
-.08, SE_b = .05, t(164) = -1.49, p = .14$. In sum, we found the expected partner, or cross-
spouse, effect for spouse criticism on patient affect in addition to finding an actor or
within-person effect for spouse criticism. Therefore, the more critical spouses were, the
more depressed affect both patients and spouses reported in the subsequent 3 hours.

3.4.2 Lagged stress generation model of depressed affect and criticism. To test a
lagged stress generation model, we used an APIM where actor criticism was the outcome
and patient and spouse depressed affect were predictors of criticism in the subsequent 3
hours (see Figure 8). Results partially supported our hypothesis that significant within-
person or actor effects would emerge for both patient and spouse depressed affect
predicting patient and spouse criticism in the subsequent 3 hours. Results revealed a
significant actor effect for spouse depressed affect, $b = .03, SE_b = .01, t(98.9) = 2.73,$
Figure 7: A diathesis-stress lagged model of depressed affect and criticism. Black paths are significant. Dashed paths approached significance. Paths not shown were not significant.

$p = .01$, such that the more depressed spouses felt the more critical they were of patients in the subsequent 3 hours. Contrary to our hypothesis, however, patient depressed affect did not significantly predict patient criticism in the subsequent 3 hours, $b = .01$, $SE_b = .01$, $t(95.8) = .97$, $p = .33$. One significant effect that was not hypothesized also emerged. Specifically, not only was there a significant actor effect for spouse depressed affect but there was also a significant partner or cross-spouse effect for spouse depressed affect, $b = .03$, $SE_b = .01$, $t(139) = 2.96$, $p = .00$, such that the more depressed spouses felt, the more critical patients were of spouses in the subsequent 3 hours. On the other hand, there was not a significant partner effect for patient depressed affect, $b = .00$, $SE_b = .01$, $t(77.7) = .43$, $p = .67$. In sum, the more depressed spouses were, the more critical they were of patients and the more critical patients were of them in the subsequent 3 hours.
3.4.3 Lagged diathesis-stress model of support and depressed affect. To test a diathesis-stress model for support, we ran an APIM that was similar to the one described in section 3.4.1, though we replaced criticism with support such that support predicted depressed affect in the subsequent 3 hours (see Figure 9). We hypothesized that there would be significant cross-spouse or partner effects. However, the only significant effect was the spouse actor effect. That is, spouse support given to patients negatively predicted spouse depressed affect in the subsequent 3 hours, $b = -.06$, $SE_b = .03$, $t(162) = -2.04$, $p = .04$. The more spouses provided support the less depressed affect spouses reported in the subsequent 3 hours. None of the other actor or partner variables significantly predicted patient or spouse depressed affect, $bs = -.03$ to $.01$, $ts = .03$ to $-1.50$, $ps = .14$ to $.97$. Therefore, contrary to predictions, we found significant actor effects such that the more support spouses gave to patients, the less depressed spouses felt in the subsequent 3 hours.
3.4.4 Lagged stress generation model of depressed affect and support. To test a diathesis-stress model for support, we ran an APIM that was similar to the one in section 3.4.2, though we replaced criticism with support such that depressed affect predicted support in the subsequent 3 hours (see Figure 10). A pattern similar to that observed for the stress generation model of criticism was found for the stress generation model of support. That is, spouse depressed affect significantly negatively predicted both spouse support, $b = -.03, SE_b = .01, t(83.7) = -2.47, p = .02$, and patient support, $b = -.03, SE_b = .01, t(70) = -2.14, p = .04$, in the subsequent 3 hours. The more depressed spouses felt, the less they supported patients and the less patients supported spouses in the subsequent 3 hours. No significant associations emerged between patient depressed affect and either patient support, $b = .00, SE_b = .01, t(74.4) = -.24, p = .81$, or spouse support, $b = -.01, SE_b = .01, t(59.2) = -.62, p = .54$. In sum, as hypothesized we found significant actor effects for spouse depressed affect predicting spouse support. We also found significant partner effects for spouse depressed affect predicting patient support given to spouses.
3.5 Other Forms of Affect

3.5.1 Anger.

*Concurrent criticism and anger.* Like the concurrent models of depressed affect, all of the actor and partner associations between criticism and anger were significant for both the diathesis-stress and stress generation models such that patient and spouse criticism were positively associated with both patient and spouse anger. Actor effects in the diathesis stress model (i.e., within-person associations between actor criticism and actor anger) were significant for both patients and spouse, $bs = .91, 1.46, SE_{bs} = .10, ts(156, 174) = 9.24, 14.11, ps < .001$. Partner effects in the diathesis-stress model (i.e., cross-spouse associations between partner criticism and actor anger) were also significant for both patients and spouses, $bs = .33, .44, SE_{bs} = .07, .08, ts(115, 187) = 5.00, 5.41, ps < .001$.

Similarly, in the stress generation model, actor effects (i.e., within-person associations between actor anger and actor criticism) were significant for both patients...
and spouses, $bs = .11, .14, SE_{bs} = .01, ts(182, 157) = 8.74, 12.08, ps < .001$. Partner effects (i.e., cross-spouse associations between partner anger and actor criticism) were also significant for both patients and spouses, $bs= .02, .05, SE_{bs} = .00, ts(105, 170) = 3.58, 6.74, ps < .001$. In sum, just as in the case of depressed affect, patient and spouse anger were significantly associated with both patient and spouse criticism at the same time point.

**Concurrent support and anger.** Unlike the concurrent diathesis-stress model for depression and support, whereby only patient support related to patient and spouse depressed affect, most of the actor and partner effects in the diathesis-stress model of support and anger were significant. That is, within-person actor effects for the relationship between support and anger were significant for both patients and spouses, $bs = -.22, -.25, SE_{bs} = .05, ts(248, 231) = -4.36, -5.09, ps < .001$, respectively, such that the more supportive people were, the less anger they had. In addition, the cross-spouse partner effect for patient partner support was significant, $b = -.04, SE_{bs} = .04, t(178) = -3.73, p < .001$, such that patient support was negatively associated with spouse actor anger. Similarly, the cross-spouse partner effect for spouse partner support approached significance, $b = -.08, SE_{b} = .04, t(218) = -1.94, p < .001$. Overall, the more supportive people were, the less angry their partners were.

In contrast to the concurrent stress generation model of depression and support, in which only spouse depressed affect was related to patient and spouse support, in the stress generation model for anger, all but one of the associations between anger and support were significant. For the actor effects, patient anger was significantly negatively related to patient support, $b = -.04, SE_{b} = .01, t(150) = -3.21, p = .002$ and spouse anger
was significantly negatively to spouse support, \( b = -0.06, SE_b = 0.01, t(166) = -4.60, p < 0.001 \). For the partner effects, spouse anger was significantly negatively associated with patient support, \( b = -0.02, SE_b = 0.01, t(102) = -2.99, p = 0.003 \). However, like the model for depression, patient anger was not significantly associated with spouse support, \( b = -0.01, SE_b = 0.01, t(86.9) = -0.98, p = 0.33 \).

**Lagged criticism and anger.** The diathesis-stress lagged model of criticism predicting anger in the subsequent 3 hours followed the exact same pattern as did the lagged diathesis-stress model for criticism predicting depressed affect. That is, spouse criticism significantly predicted spouse anger in the subsequent 3 hours, \( b = 0.15, SE_b = 0.08, t(168) = 1.99, p < 0.05 \). As well, the association between spouse criticism and patient anger neared significance, \( b = 0.11, SE_b = 0.06, t(98.1) = 1.89, p = 0.06 \). There were no significant associations between patient criticism and patient or spouse anger, \( bs = 0.03, 0.00, SE_{bs} = 0.07, 0.04, ts (148, 51.7) = .46, .02, ps = .65, .99 \) (i.e., patient actor and patient partner effects). Therefore, it appears that spouse criticism predicts not only patient and spouse depressed affect but it also predicts patient and spouse anger in the subsequent 3 hours. On the other hand, there appear to be no significant associations between patient criticism and patient or spouse depressed or angry affect.

In the lagged stress generation model of anger predicting criticism in the subsequent 3 hours, similar to the model for depression and criticism, actor and partner effects for spousal anger were significant, \( b = 0.02, SE_b = 0.01, t(133) = 3.52, p < 0.001 \) for the spouse actor effect and \( b = 0.02, SE_b = 0.01, t(195) = 3.50, p < 0.001 \) for the spouse partner effect. That is, spouse anger predicted both spouse and patient criticism in the subsequent 3 hours. Unlike the model for depressed affect and criticism, there was one
additional significant effect. That is, patient anger significantly predicted patient criticism of spouses in the subsequent 3 hours, $b = .02, SE_b = .01, t(162) = 2.02, p < .05.$

*Lagged support and anger.* In contrast to the lagged diathesis-stress model of support and depressed affect (in which only spouse support predicted spouse depressed affect in the subsequent 3 hours), actor effects were significant for both patients and spouses in the diathesis-stress model of support and anger. That is, in the lagged diathesis-stress model of support and anger, patient support significantly predicted less patient anger in the subsequent 3 hours, $b = -.07, SE_b = .04, t(210) = -1.97, p < .05.$ As well, spouse support provided predicted less spouse anger in the subsequent 3 hours, $b = -.09, SE_b = .03, t(174) = -2.48, p = .01.$ In sum, the less support patients gave, the more depressed they felt in the subsequent 3 hours and the less support spouses gave, the more depressed they felt in the subsequent 3 hours.

The stress generation model of lagged anger and support was identical to the lagged stress generation model for depressed affect and support. That is, spouse anger significantly negatively predicted spouse and patient support occurring in the subsequent 3 hours, $b = -.02, SE_b = .01, t(131) = -2.34, p = .02$ for the actor effect of spouse anger and $b = -.02, SE_b = .01, t(150) = -2.10, p = .04$ for the partner effect of spouse anger. No significant associations existed between patient anger and either patient or spouse support, $bs = -.01, SE_{bs} = .01, ts(94.5, 131) = -1.26, -1.34, ps = .21$ for patient actor and patient partner effects, respectively. In sum, the more angry spouses were the less support both spouses and patients provided in the subsequent 3 hours.
3.5.2 Anxiety

*Concurrent criticism and anxiety.* Similar to depression, most all concurrent actor and partner associations between criticism and anxiety were significant. In the diathesis-stress model, actor effects were significant such that patient criticism was positively associated with patient anxious affect, $b = .52, SE_b = .08, t(145) = 6.77, p < .001$, and spouse criticism was positively associated with spouse anxious affect, $b = .74, SE_b = .08, t(153) = 9.43, p < .001$. However, only one partner effect was significant. That is, while spouse criticism was significantly related to patient anxiety, $b = .26, SE_b = .07, t(153) = 3.84, p < .001$, patient criticism was not significantly associated with spouse anxiety, $b = .04, SE_b = .05, t(78.6) = .91, p = .37$.

For the stress generation model, all actor and partner effects were significant such that patient and spouse anxious affect were significantly associated with patient and spouse criticism. For example, patient anxiety was significantly associated with patient criticism, $b = .09, SE_b = .01, t(171) = 7.84, p < .001$, and spouse anxiety was significantly associated with spouse criticism, $b = .11, SE_b = .01, t(168) = 10.04, p < .001$. In addition partner effects were significant such that patient anxiety was significantly associated with spouse criticism, $b = .03, SE_b = .01, t(99.4) = 3.45, p = .001$, and spouse anxiety was significantly associated with patient criticism, $b = .01, SE_b = .01, t(191) = 3.31, p < .001$. In sum, the more anxious patients and spouses were the more critical they were during the same 3 hour period.

*Concurrent support and anxiety.* Like the concurrent model of depressed affect and support, results were similar for concurrent associations between anxiety and support. In the diathesis-stress model, patient support was significantly associated with
both patient anxiety, $b = -.14, SE_b = .04, t(238) = -3.36, p < .001$ and spouse anxiety, $b = -.08, SE_b = .03, t(140) = -2.42, p = .02$. However, spouse support was not significantly associated with spouse anxious affect, $b = -.06, SE_b = .04, t(179) = -1.67, p = .10$ or patient anxious affect, $b = .00, SE_b = .04, t(238) = .03, p = .97$. In sum, the more support patients provided, the less anxious both patients and spouses felt during the same 3 hour period.

In the stress generation model, results were somewhat different than the stress generation concurrent model for depressed affect and anger. In the stress generation model of anxious affect, only actor effects were significant such that patient anxiety was significantly negatively associated with patient support, $b = -.03, SE_b = .01, t(126) = -2.43, p = .02$ and spouse anxiety was significantly negatively associated with spouse support, $b = -0.04, SE_b = .01, t(166) = -2.43, p = .02$. Partner effects were not significant, $b = .00, SE_b = .01, t(93.1) = -.10, p = .92$ for the patient partner effect and $b = -.02, SE_b = .01, t(120) = -1.45, p = .15$ for the spouse partner effect. It appears that only within-person effects exist for the association between anxiety and support provision such that the more anxious people felt, the less support they provided during the same 3 hour period.

*Lagged criticism and anxiety.* The lagged diathesis-stress model of anxiety and criticism was somewhat different than the lagged diathesis-stress model of depressed affect and anger. In the diathesis-stress model of anxiety, the association between spouse actor criticism and spouse anxiety was not significant ($p = .08$) whereas it was significant in the models of depressed affect and anger. Also, in the model for anxiety, the association between spouse partner criticism and patient anxiety was significant, $b = .15,$
$SE_b = .05, t(151) = 2.81, p = .01$ whereas in the models of depressed affect and anger, this association only approached significance ($ps = .06$). In sum, the more critical spouses were of patients, the more anxious patients felt in the subsequent 3 hours.

For the lagged stress generation model of anxiety and criticism, like the models of depressed affect and anger, spouse anxiety predicted spouse criticism in the subsequent 3 hours, $b = .02, SE_b = .01, t(150) = 2.71, p = .01$. In addition, like the models of depressed affect and anger, spouse anxiety predicted patient criticism in the subsequent 3 hours, $b = .02, SE_b = .01, t(228) = 2.84, p < .01$. There were no significant within- or cross-spouse associations for patient anxiety in relation to patient and spouse criticism, $bs = .00, SE_{bs} = .01, ts(152, 81) = .33, 1.79, ps = .74, .08$. In sum, the more anxious spouses felt, the more critical they were of patients and the more critical patients were of them in the subsequent 3 hours.

**Lagged support and anxiety.** The lagged diathesis-stress model for support and anxiety was similar to the lagged diathesis-stress model of support and depressed affect. In the lagged diathesis-stress model of support and anxiety, only spouse support negatively predicted spouse anxiety in the subsequent 3 hours, $b = -.09, SE_b = .03, t(143) = -2.85, p = .01$. None of the other within- or cross-spouse effects were significant ($bs$ ranged from $.00$ to $-.02$ and $ps$ ranged from $.62$ to $.92$). Therefore, the more support spouses gave, the less anxious spouses felt in the subsequent 3 hours.

Turning to the lagged stress generation model where anxiety predicts later support, unlike the model for lagged depressed affect and support where spouse depressed affect predicted patient and spouse support given in the subsequent 3 hours, in no case did anxiety predict the amount of support given ($bs$ ranged from $-.02$ to $.01$ and
Therefore, anxiety does not seem to predict the amount of support that either patients or spouses give in the subsequent 3 hours.

3.5.3 Positive Affect

*Concurrent criticism and positive affect.* In the concurrent diathesis-stress model of criticism and positive affect, unlike for depressed affect and criticism where all actor and partner effects were significant, only spouse actor criticism was negatively related to spouse positive affect, $b = -.42, SE_b = .08, t(153) = -5.44, p < .001$. In other words, the more critical spouses were, the less positive affect they had at the same time point. It should be noted however, that the association between spouse criticism and patient positive affect neared significance, $b = -.12, SE_b = .06, t(84.8) = -1.93, p = .06$.

In the concurrent stress generation model, only spouse positive affect was significantly associated with spouse criticism, $b = -.42, SE_b = .08, t(153) = -5.44, p < .001$. None of the other effects were significant ($bs$ ranged from -.01 to .00, $ps$ ranged from .22 to .34). Therefore it seems that in both of the concurrent models for support and positive affect, only spouse positive affect is significantly associated with spouse criticism.

*Concurrent support and positive affect.* In the concurrent diathesis-stress model, support was related to positive affect for both patient and spouse actor effects, $bs = .52, .74, SE_{bs} = .05, ts(219, 266) = 10.14, 13.89, ps < .001$ for patient and spouse actor effects, respectively. As well, all partner effects were significant for both patients and spouses such that patient support was significantly associated with spouse positive affect, $b = .11, SE_b = .04, t(237) = 2.65, p = .01$ and spouse support was significantly associated with
patient positive affect, $b = .10, SE_b = .04, t(188) = 2.56, p = .01$. Thus, the more support patients and spouses provided the more positive affect they had at the same time point.

The results for the concurrent stress generation model of positive affect and support were somewhat similar to the diathesis-stress model in that positive affect was related to support in most cases, $bs = .11, .12, .02, SE_{bs} = .01, ts(254, 194, 140) = 11.84, 14.02, 2.92, ps < .01$ for the patient actor effect, spouse actor effect, and spouse partner effect, respectively. The only association that was not significant was that between patient support and spouse positive affect, $b = .01, SE_b = .01, t(194) = 1.47, p = .14$. In general, the more patients and spouses had positive affect, the more they also provided support.

*Lagged criticism and positive affect.* For the lagged diathesis-stress model of affect and criticism, the associations were somewhat different for positive affect than for depressed affect. That is, only patient criticism predicted patient positive affect in the subsequent 3 hours, $b = -.15, SE_b = .05, t(3346) = -2.99, p < .01$ such that the more critical patients were of spouses, the less positive affect they reported in the subsequent 3 hours.

For the lagged stress generation model of positive affect and criticism, the association between spouse positive affect and spouse criticism in the subsequent 3 hours neared significance, $b = -.01, SE_b = .00, t(158) = -1.90, p = .06$. There was also a significant association between patient positive affect and spouse criticism in the subsequent 3 hours, $b = -.01, SE_b = .00, t(138) = -2.79, p = .01$. Therefore, it seems that the more positive affect patients and spouses report, the less critical spouses are in the subsequent 3 hours.
Lagged support and positive affect. For the lagged diathesis-stress model of support and positive affect, there were significant actor effects for both patients and spouses such that the amount of support patients gave was positively associated with patient positive affect in the subsequent 3 hours, $b = .15$, $SE_b = .05$, $t(154) = 3.22$, $p = .00$, and the amount of support spouses gave was positively related to spouse positive affect in the subsequent 3 hours, $b = .13$, $SE_b = .05$, $t(240) = 2.62$, $p = .01$. This was identical to the pattern observed for support and anxiety and similar to the pattern observed for the diathesis-stress models of support and depressed and angry affect. Therefore, it seems that the more patients and spouses support partners, the more positive affect they report in the subsequent 3 hours.

For the lagged stress generation model of support, both actor effects were significant such that patient positive affect positively predicted patient support, $b = .03$, $SE_b = .01$, $t(235) = 4.34$, $p < .001$, and spouse positive affect positively predicted spouse support, $b = .01$, $SE_b = .01$, $t(130) = 2.01$, $p = .05$. Therefore, combining the results of the diathesis-stress and stress generation models of positive affect and support, it seems that there are within-person effects such that patient positive affect predicts later patient support, and the reverse is also true – patient support predicts later patient positive affect. The same within-person pattern was also true for the relationship between spouse positive affect and spouse support.
CHAPTER 4:

DISCUSSION

The primary purpose of this investigation was to test an APIM of cross- and within-spouse associations between spousal affect and behavior as well as to compare traditional and new pathways suggested by diathesis-stress and stress generation models. Analyses of affect and behavior assessed every 3 hours for 2 weeks revealed both concurrent and lagged relationships between affect and behavior (criticism and support) in couples with CLBP. In a very general sense, the most important contribution of such results is that they highlight the necessity of revising previous theories of spousal affect and behavior to also account for new within- and cross- spouse associations to gain a more comprehensive and couples level view of patient and spouse affect and behavior. Most notably our results call for the necessity of accounting for the effects of being critical on one’s own affect as well as the impact of spouse affect on spouse and patient behavior. Not only are such relationships important in their own right and require further replication and theory development but also the existence of such relationships suggests that previous investigations that have not also included both patient and spouse affect and behavior, may be inadequate, leading to incorrect parameter estimation of other key relationships.
4.1 New Considerations for Diathesis-stress Models

The most important finding of this study was the documentation of novel within-spouse relationships between spouse behavior and subsequent spouse affect which supports adding new paths to diathesis-stress models. For example, EE models (e.g., Hooley, 2007) focus on the relationship between spouse criticism and later patient associations between being critical and one’s own later psychopathology. Likewise, the martial discord model of depression (Beach et al., 1990) also stresses cross-spouse relations between criticism and depression. In the current study however, not only did we find evidence for these traditionally studied cross-spouse relations, but we also found significant within-person associations that have been relatively neglected. Specifically, in both the concurrent and lagged models, the more critical spouses were, and the less support spouses provided, the more depressed spouses felt. These within-person associations underscore the importance of considering how being critical and providing support impact spouse affect. Previous work has documented how providing support improves the mood of the support provider (Gleason, Iida, Bolger, & Shrout, 2003; Knoll, Kienle, Buaer, Pfuller, Luszczynska, 2007). However, we are unaware of any studies that have directly investigated the impact of being critical, because the literature on criticism is exclusively focused on the impact of being criticized. If our results are replicated it would suggest that one possible mechanism accounting for spousal depressed mood may be through spouses negative behaviors toward patients.

Besides being important in its own right, the significant within-person association between spouse criticism and later spouse depressed affect has implications for other paths in dyadic models that focus on the effect of being criticized (i.e., EE models). To
the extent that being critical is correlated with being criticized, failing to account for
being critical distorts the association between being criticized and mood. In the social
support literature Brown, Nesse, Vinokur, and Smith (2003) argue the importance of
including providing support in models of receiving support for this same reason. They
found that receiving support did not predict mortality once they accounted for the effect
of providing support, thus emphasizing the need to include providing support in models
of receiving support. In a similar manner, controlling for the effects of being critical as
we did in this investigation might improve models of EE and other diathesis-stress
models that have traditionally focused solely on the effects of being criticized.

Although we found significant within-person associations between spouse
criticism and spouse affect, we did not find similar within-person associations between
patient criticism and patient depressed affect in the subsequent 3 hours. This mirrors
findings of Miklowitz and colleagues (2005) who found that bipolar disorder patients’
criticism of relatives did not predict patient depressive symptoms at follow-up. We are
not aware of any other longitudinal investigations of patient criticism and subsequent
patient mood. Therefore, although we did not test whether within-person lagged
associations differed significantly for patients and spouses, being critical predicted later
depressed affect for caregivers of patients rather than for patients themselves. Perhaps
patient affect is more related to other salient phenomena, such as pain, that have been
previously linked to patient affect (Feldman et al., 1999). Or, perhaps criticizing a patient
with a chronic medical condition is more depressing than criticizing a spouse without a
chronic medical condition because spouses experience more guilt or shame for criticizing
suffering loved ones than they would if they criticized partners who do not have an
illness. If criticizing a partner with a chronic medical illness is more depressing than criticizing a partner without a chronic medical illness, it may partially explain the higher than average rates of depression in spouses whose partners have medical conditions such as CLBP (Flor et al., 1987).

4.2 New Considerations for Stress Generation Models

The second most important finding was that in addition to the new within-person paths implicated for diathesis-stress models, results also suggest adding paths to stress generation models. Most stress generation models focus on how patient mood and patient behavior result in interpersonal conflict (Hammen, 2006; Davila, et al., 1997) but fail to address how spouse mood results in patient and spouse behavior. We found that both concurrently and in the subsequent 3 hours spouse depressed affect predicted both spouse criticism and support of patients as well as patient criticism and support of spouses. This underscores the importance of spouse affect in predicting both patient and spouse behaviors (i.e., criticism and support) that are associated with marital distress (Davila et al., 1997; Hooley & Teasdale, 1989). In addition, these effects recommend stress generation paths be added to Leonard and colleagues’ (2006) model of CLBP, marital conflict, and psychological distress, a model which currently only includes diathesis-stress pathways representing how marital behavior predicts psychological distress over time. Our results suggest that this model should also include how psychological distress may influence marital behavior over time.

We found evidence that spouse psychological distress may influence marital behavior in the following two ways: 1) by predicting patient behavior, and 2) by
predicting spouse behavior. Focusing first on the cross-spouse stress generation effect, whereby spouse depressed affect predicted later patient behavior toward spouses, this effect replicates general findings in the depression literature according to which people prone to depression generate stress in their interpersonal relationships (for reviews see Hammen, 2006; Liu & Alloy, 2010; Rehman et al., 2008). Most stress generation investigations, however, focus on person-dependent life events or characteristics such as personality that contribute to relationship stress. Relatively neglected is another’s specific behavior in response to displays of depressed affect. Therefore, to our knowledge the current study is unique in documenting that spouse depressed affect positively predicts patient criticism and negatively predicts patient support in the subsequent 3 hours. These results also seem to contradict findings from studies that have investigated patient depression and spouse behaviors. In samples of clinically depressed and martially discordant spouses, displays of depression have inhibited partner negative behavior (Biglan et al, 1985), and in samples of RA patients, patient depression elicited support from spouses (Revenson & Majerovitz (1990). Therefore, the status of the relationship between depressed affect and partner support and criticism is complex, with results suggesting that behaviors might differ in response to patient or spouse affect. Behavioral responses to spouse depressed affect may be more negative than behavioral responses to patient depressed affect perhaps because patient depressed affect is more expected given patients’ illness and less expected or tolerated in spouses that are not dealing with a chronic medical condition.

Turning to the within-person stress generation links between spouse affect and spouse behavior, we found that spouse depressed affect positively predicted spouse
criticism and negatively predicted spouse support in the subsequent 3 hours. Such inquiry into the within-person paths representing how affect influences people’s own behavior is scarce, especially in the pain literature. However, several studies, including ones with couples with chronic medical conditions, have shown that when spouses are more depressed, they provide less support to patients (Iida et al, 2008; Revenson & Majerovitz, 1990). In contrast, while there appear to be no studies of the relationship between affect and criticism, relatives’ depressive symptoms have been positively related to the number of critical comments relatives make about patients with bipolar disorder (McMurrich & Johnson, 2009). Therefore, it appears likely that spouse depressed affect is also related to criticizing patients and thus this finding is important not only for stress generation conceptualizations but also for diathesis-stress models which have begun to expand to account for why relatives might become highly critical of patients. Our findings suggest that spouses’ depressed affect might contribute to spouse criticism of patients and thus adds to the growing evidence that family members’ depressive affect or depressive symptoms may be promising targets for interventions designed to reduce family criticism (McMurrich & Johnson, 2009).

4.3 Traditional Paths in Diathesis-stress Models

Not only did results support new paths, they also supported some traditional paths found in models of behavior and emotion. In the diathesis-stress lagged model the association between spouse criticism and subsequent patient depressed affect neared significance. This mirrors a large body of work demonstrating spouse criticism predicts depressive relapse and depressive symptoms over time (Hooley, 2007; Renshaw, 2008)
and provides preliminary evidence that spouse criticism impacts patient depressed affect on a *daily* basis. Contrary to our hypotheses however, in both the concurrent and lagged diathesis-stress models of spouse support and patient depressed affect, spouse support did not significantly predict patient depressed affect. This reflects the generally mixed results in the social support literature in pain samples in which spouse support provided to patients is sometimes associated with patients’ less negative mood and at other times support received has resulted in patients’ negative mood (see Leonard et al., 2006 for a review). In sum, traditional paths studied in diathesis-stress models were supported, thus providing more evidence for how spouse criticism and support are related to patient affect on a daily basis. That is, spouse criticism but not support is related to patient depressed affect both concurrently and in the subsequent 3 hours.

4.4 Traditional Paths in Stress Generation Models

Turning to the stress generation models, our results are somewhat unexpected because we did not find support for traditional paths (e.g., associations between patient depressed affect and later patient and spouse behavior). It is unclear why we did not find support for the stress generation model of *patient* affect even though we found evidence to support the stress generation model for *spouse* affect as described in section 4.2. Perhaps other characteristics of patients, such as functional disability, generated marital stress (Geisser, Cano & Leonard, 2005); evidence from the current study suggests that other forms of patient affect such as patient anger and positive affect are more highly related to stress generation processes over time. In addition, there were no lagged associations between patient affect and behavior in the subsequent 3 hours. Even so, as
hypothesized, patient depressed affect was concurrently related to both patient and spouse criticism, suggesting that patient depressed affect is related to patient and spouse criticism, though relations such as these may not persist over time in patients with CLBP.

In regards to the concurrent model of support and depressed affect, only patient and not spouse support was related to patient depressed affect. This is reminiscent of the broader literature (as described in section 4.2) in which depressed affect has, in some instances elicited support provision, whereas, in other instances depressed affect has inhibited support provision. Perhaps our non-significant findings correctly reflect the lack of relationship between support receipt and depressed affect. Alternatively, our non-significant findings may have been due to our measurement of support. We relied on spouse reports of their own support provision. Had we used patient self-reports of perceived support such perceptions may have been related to patient negative affect (Feldman, et al., 1999). Regardless, it is noteworthy that we did not find any evidence of stress generation processes for patient depressed affect of the sort we had hypothesized.

4.5 Other Forms of Affect

In addition to finding relations between depressed affect and behavior, we also found that anger, anxiety, and positive affect were related to behavior.

4.5.1 Anger. The same associations that existed between depressed affect and behavior also existed for associations between anger and behavior, suggesting depression and anger may function similarly, perhaps because of their association with the overarching construct of negative affect. However, one pathway existed for anger that did not exist for depressed affect. Lagged patient anger predicted patient criticism of spouses
in the subsequent 3 hours. This, along with the finding that spouse anger also predicted spouse criticism, concurs with other evidence that within-people, changes in anger lead to changes in negative communication (Sanford, 2007). Together these findings are consistent with the idea that anger is a hard emotion that protects people from harm by motivating them to remove the source of harm with antagonism, fighting, and the assertion of control (Sanford, 2007; Smith & Lazarus, 1990).

It is noteworthy that the association between patient anger and subsequent patient criticism was the only significant within-person association between patient negative affect (depression, anger, or anxiety) and patient behavior. Therefore, patient anger may be uniquely tied to patient marital conflict generation through being critical. That anger was related to patient criticism is also noteworthy given that anger is a correlate of CLBP (Fernandez & Turk, 1996). It is surprising that although we found patient anger was tied to later patient criticism, we did not find that patient anger was related to later spouse criticism. A study by Burns and colleagues (1996) suggested patient anger may elicit negative spousal responses. We replicated this finding in the concurrent results, but when looking at this association over time, we did not find support that patient anger predicted negative spouse responses in the subsequent 3 hours. This may be a consequence of our controlling for the association between patient anger and patients’ own criticism. In any event, patient criticism toward spouses must be controlled for when investigating how patient anger influences later spouse criticism.

4.5.2 Anxiety. Generally similar associations existed between anxiety and behavior as existed for associations between depressed affect and behavior, suggesting that anxiety, depression, and anger might share overlapping associations with behavior.
For example, although spouse criticism significantly predicted patient anxiety in the subsequent 3 hours ($b = .15, p < .01$) and this association only neared significance for patient depressed affect ($b = .09, p < .06$), the difference between the association of spouse criticism and patient depression and anxiety was not significant. Regardless, future studies should continue to test for differences between how criticism might lead to depression and anxiety, as another study indicated that spouse negative responses to pain behaviors are uniquely related to patient anxiety (Cano et al., 2004). This finding led the authors to suggest that marital responses to behaviors are more related to patient anxiety than to depression because they might increase patient concern about the impact of their functioning on their relationship.

It is also interesting to note that spouse anxiety did not influence later patient and spouse support as did depression and anger. Anxiety may not be as tied to support provision because at times anxiety might lead to increased support (i.e., worrying about partners might make people more prone to help) but at other times anxiety might lead to decreased support (i.e., if worrying inhibits action). A similar hypothesis was developed by Hinnen and colleagues (2007) who propose that neuroticism inhibits support provision because it makes spouses hyper-vigilant to threats to themselves, thus rendering them less available to attend to partners’ worries in a responsive way. Anxiety may function in a similar manner if the amount of anxiety exceeds a certain threshold below which anxiety might enhance support provision.

4.5.3 Positive affect. Different relationships emerged for positive affect and behavior compared to relationships between negative affect and behavior. Patient positive affect negatively predicted spouse criticism of patients in the subsequent 3 hours such
that the more positive affect patients had the less critical spouses were of patients. In fact, patient positive affect was the only form of patient affect that predicted later spouse criticism, suggesting that positive affect may protect against spouse criticism. As well, patient positive affect was the only form of patient affect predicting how patients acted toward spouses in the subsequent 3 hours. The more positive affect patients had the more support patients gave spouses in the subsequent 3 hours. Therefore it seems that for patients with CLBP, patient positive affect reflects how critical spouses are as well as how much support patients provide. In both instances patient positive affect might be a protective factor against marital distress and an indicator of stress generation processes (when patients have low levels of positive affect).

In addition, we found significant within-person associations whereby patient and spouse support provision positively predicted patient and spouse positive affect in the subsequent 3 hours. It must be noted too that we also found that positive affect was related to support provision for both patients and spouses, suggesting that there is a bidirectional relationship between positive affect and support provision. Therefore, focusing on support provision may be an especially promising target of intervention in couples with CLBP because it may increase positive affect and decrease marital conflict.

4.6 Limitations

Like any study, this investigation had a number of limitations that must be noted. First, although it is tempting to compare how well the diathesis-stress and stress generation models were supported in the current study, the design of the study does not allow us to make such direct comparisons. The purpose of this study was to roughly
extend the premises behind each theory to test the models on a daily level using a dyadic approach to examine relations between spousal affect and behavior. Therefore we were not testing the exact tenets set forth in the diathesis-stress and stress generation theories. For example, fully testing a diathesis-stress model would have required us to measure and test a diathesis such as negative schemas (Banks & Kerns, 1996) and to see how this moderated the association between spouse behavior and later affect. As well, an adequate test of the stress generation model would have required that we measure actual stress generation outcomes. That is, despite evidence suggesting that spousal criticism and lack of spousal support leads to marital discord, we did not directly test such associations to see if the link between spousal affect and marital discord was mediated by spousal criticism and support. Lastly, we were unable to directly compare how well our results fit both theories in part because both theories are in some ways compatible. That is, in diathesis-stress theories, such as the marital discord model of depression, after time, marital discord and depression become intertwined in an ongoing cycle and thus are somewhat inseparable from stress generation theories which also link depression with relational discord (Beach et al., 1990).

Second, it is also imperative not to generalize the results beyond the specific sample and time period investigated. We tested affect and behavior over 3 hour intervals in a predominately Caucasian, middle-aged sample of couples with one partner having CLBP. We cannot generalize to other populations or time-frames.

There are also several measurement considerations that need to be taken into account when interpreting the results of this study. First, we changed the original POMS-15 scale used to measure affect and we are unaware how this may have affected the
psychometric properties of the scale. For example, in order to make the scale more theoretically relevant to CLBP patients, several adjectives were slightly modified. That is, “helpless” replaced “hopeless”, “irritated” replaced “resentful”, and “happy” replaced “vigorous.” As well, the original 5-point Likert scale was changed to a 9-point Likert scale. Therefore, our results can not be directly compared to investigations that use the original scale. Second, it is important to note that we relied on self-reports of criticism and support. Our results may have been different had we used reports of perceived criticism and support. For example, given shared reporter variance, had we used reports of perceived criticism and support, we may have found more evidence for cross-spouse effects than we did in the current study. We decided to measure reports of behavior rather than reports of perceived behaviors for several reasons as noted on pages 49-50. In general though, we think that both actual and perceived behaviors are important but different phenomena in their own right and future studies might examine relations of affect with perceived behaviors and compare the results to those found in the current study.

Lastly, it is important to remain mindful that we can not draw causal conclusions in explaining the associations found in this study as we did not use an experimental design. Therefore, the results we did obtain could have been due to another third variable that we did not account for, such as pain or catastrophizing, that has been implicated in spousal behaviors and affect in samples of pain patients and spouses (Feldman et al., 1999; Holtzman et al., 2007). As well, it is possible that our results may have been biased due to data not missing at random, which further recommends experimental studies to investigate causal relations between affect and behavior.
4.7 Conclusion and Future Directions

This study contributes to the field in that it was the first known study to test a fully dyadic model of spousal behavior and affect in couples with CLBP thus suggesting that not only is such a model feasible but also that such a model is imperative to capture a broader view of the nature of the relationship between affect and behavior in couples with CLBP. Using the APIM model, we uncovered several new and important associations between spouse affect and behavior, namely, within-person bi-directional associations between spouse behavior and affect and cross-spouse associations between spouse affect and patient behavior in the subsequent 3 hours. These pathways suggest that spousal depressed affect might be an important stress generating mechanism in couples with CLBP in that not only may it elicit criticism from patients but also spousal depressed affect may be a key contributor to the development of spousal criticism of patients. As well, they suggest that spouses’ own behavior toward patients might contribute to spousal depression. Heretofore, such associations have not been accounted for in most theory and empirical investigations and therefore these results emphasize the need to revise theory to incorporate how spouse depressed affect might contribute to stress generation and marital discord in couples with CLBP as well as how spouse behavior might contribute to spouse depression.

In the future, it would be profitable to determine if associations between momentary behavior and affect predict more stable spouse depressive symptoms or marital conflict because such associations may explain the development of spouse depressive symptoms and marital conflict in such couples with CLBP. Given that we can not draw causal conclusions from our study, it would also be wise to conduct
experimental studies that manipulate spouse affect and spouse criticism to see if spouse affect might actually cause marital conflict and to see if spouse criticism might actually cause spouse depression.

Our study is also unique in that in addition to depressed affect, we also investigated other forms of affect and found that patient anger, anxiety, and positive affect were related to behavior in ways that patient depressed affect was not, suggesting that for patients other forms of affect might be more worthy of intervention and further scrutiny. In particular, patient positive affect may be a protective factor against spousal criticism. Patient anger may generate patient criticism. Given that anger is associated with CLBP (Fernandez & Turk, 1996), our finding that patient anger predicted patient criticism might explain why couples with CLBP have higher than average rates of marital discord. In this regard, future studies should explore if patient anger is uniquely related to patient criticism and if patient positive affect is uniquely negatively related to spouse criticism as we did not test whether the associations differed between patient anger and patient depressed affect or patient positive affect and patient depressed affect.

Our study also has potentially important implications for treatment. Given that we found a bi-directional relationship between spouse depressed affect and behavior, spouse depression might be an important target of interventions designed to reduce relatives’ criticism. In fact, McMurrich and Johnson (2009), recalling the limited success of family treatments to reduce family criticism toward patients and citing that depression often results in family conflict and hostile behavior toward others, call for increased attention to be paid to relatives’ depressive symptoms in order to help alleviate family criticism. The same premise could be applied to couples’ treatments for those with CLBP; targeting
spouse depressed affect may help alleviate marital conflict (both spouse and patient criticism) and help spouses be more supportive and effective caregivers.

Lastly, our dyadic model of affect and behavior might profitably be tested in other samples such as those with couples or families with MDD patients or with married community couples, and as such our results might have implications for the broader literature on EE and marital discord beyond informing the literature on couples with CLBP. In all, this study makes several unique contributions to the CLBP literature, underscoring new paths and new forms of affect to create a more comprehensive dyadic model of spousal affect and behavior that includes 1) how spouse depressed affect generates criticism and marital stress; 2) how spouse behavior may contribute to spouse depression; and 3) how other forms of patient affect such as patient anger and positive affect may be important in the marital functioning in couples with CLBP.


interactions and expressions of pain and affective distress. *Behavior Therapy, 22*, 101-111.


