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# A Pilot Study Examining the Role of Treatment Type and Gender in Cortisol Functioning

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# ABSTRACT

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This pilot study examined the effectiveness of Emotionally Focused Couples Therapy (EFT) compared to Treatment As Usual (TAU) in improving cortisol functioning among distressed couples. It also investigated the role of gender in cortisol functioning. Measures for cortisol were collected at five time points, both at pre- and posttreatment. Data were collected from a total of 60 couples, 20 of which received EFT and 40 of which received TAU. Overall, results from a two-way analysis of variance suggest that there are no significant differences between men or women, nor among couples in EFT and TAU, in posttreatment cortisol functioning. Directions for future research are discussed.

Keywords: cortisol, emotionally focused therapy, health, relationship distress

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# The Role of Treatment Type and Gender in Cortisol Functioning

Marital relationships impact a variety of health outcomes (see Robles, Slatcher, Trombello, & McGinn, 2014), including the activation of stress responses. Part of the body's autonomic response to stress includes excretion of the stress hormone cortisol. Cortisol secretion serves as a reliable means for analyzing responses to possible threats or stressful situations (Dickerson & Kemeny, 2004; Giese-Davis, Sephton, Abercrombie, Duran, & Spiegel, 2004), including those that result from marital distress (Dickerson, 2011; Heffner et al., 2006; Saxbe & Repetti, 2010). Indeed, research shows that marital conflict and low levels of relationship satisfaction are linked to elevated stress responses (Kiecolt-Glaser & Newton, 2001; Robles et al., 2014), whereas relationships with higher levels of satisfaction can serve as a buffer against stress (Ditzen, Hoppmann, & Klumb, 2008; Johnson, 2004), lessening the impact of autonomic stress responses (Heffner, Kiecolt-Glaser, Loving, Glaser, & Malarkey, 2004).

The impact of relationship distress on cortisol secretion is concerning because of the devastating physical and mental health effects aberrant cortisol functioning can have, including problems such as learning deficits, immune system dysregulation, and cardiovascular disease (Gruenewald, Seeman, Ryff, Karlamangla, & Singer, 2006; Kiecolt-Glaser & Newton, 2001; McEwen, 1998). The myriad of health problems caused by aberrant cortisol functioning are also worrisome because at any given time, as many as 20-32% of married couples in the United States report experiencing marital discord and/or being distressed (Bradbury, Fincham, & Beach, 2000; Whisman, Beach, & Snyder, 2008). This means that a large portion of the population may be prone to the negative health outcomes that can result from aberrant cortisol functioning brought on by relationship distress.

Because of the vast effects of aberrant cortisol functioning, it is important to understand factors that might improve it. Considering the powerful influence that romantic relationships can have on stress responses, it is plausible that couple therapy could lead to improved cortisol functioning by decreasing relationship distress. Even though there is substantial evidence that marital distress and its effects negatively impact cortisol functioning (Cacioppo et al., 2000; Pope & Smith, 1991; Ranjit et al., 2009), it is unclear how couple therapy might affect cortisol functioning among distressed couples. Among a variety of couple therapy approaches, Emotionally Focused Couples Therapy (EFT) has been identified as a particularly efficacious method for treating relationship distress (Johnson, Hunsley, Greenberg, & Schnidler, 1999; Lebow, Chambers, Christensen, & Johnson, 2012). Because the beginning of treatment in EFT focuses on reducing the demand/withdraw interaction that couples often experience (Johnson, 2004) – a relational pattern that has been linked with impaired cortisol functioning (Heffner et al., 2006; Kiecolt-Glaser et al., 1996) – it may also be especially effective at reducing aberrant cortisol functioning among distressed couples. Thus, the aim of this study is to compare the effectiveness of EFT compared to Treatment as Usual (TAU) in improving cortisol functioning among distressed couples. This study, with its examination of the effectiveness of a specific type of couple therapy (EFT) in improving cortisol functioning, is the first of its kind and is an important step in understanding interventions at the marital level for improving key health markers.

## Literature Review

### Theoretical Rationale

Relational factors that impact cortisol functioning are informed through Social Self Preservation Theory. One of the tenets of Social Self Preservation Theory focuses on social evaluative threat (SET) – a term that describes experiences wherein the self could be negatively judged by others (Dickerson, 2011; Dickerson & Kemeny, 2004). Social Self Preservation Theory proposes that when SET is activated by threats to one's social self, a specific physiological reaction occurs (Gruenewald, Kemeny, Aziz, Fahey, 2004). In terms of relationship distress, SET may occur when a partner feels put down, criticized, or rejected (Dickerson, 2011). The possibility of rejection or being perceived negatively – aspects of the "social self" (Dickerson & Kemeny, 2004) that are often activated during negative marital interactions (Hazan & Shaver, 1994; Johnson, 2004; Papp, Kouros, & Cummings, 2009) – also activates the hypothalamic-pituitary-adrenal corticol axis (HPA; Dickerson, 2011; Dickerson & Kemeny, 2004), the part of the brain where cortisol is released. This notion is supported by research showing that the HPA is sensitive to social inputs including social support, relationship satisfaction, marital interactions, and attachment style (Dickerson, 2011; Ditzen et al., 2007; Heffner et al., 2004; Kirschbaum, Klauer, Fillipp, & Hellhammer, 1995; Saxbe & Repetti, 2010).

Experiencing a lack of control is another mechanism by which Social Self Preservation Theory provides an understanding for the link between marital distress and cortisol functioning. A lack of control can result from or coincide with experiencing rejection (see Dickerson & Zoccola, 2013), an experience that is common among distressed couples (Johnson, 2004). This is concerning because feeling a lack of control is linked to heightened cortisol responses and lengthened recovery from stress (Dickerson & Zoccola, 2013). Individuals experience a lack of control when they "are unable to avoid negative consequences or cannot succeed despite their best efforts" (Dickerson & Kemeny, 2004, p. 358) – a dynamic that is often experienced in the course of marital distress, as partners can feel increasingly hopeless about how to improve their relationship, despite their earnest efforts to do so (Johnson, 2004). This leaves distressed partners with the sense that nothing “can be done to change the situation” (Dickerson & Kemeny, 2004, p. 385).

Additionally, the demand/withdraw sequence is another relationship dynamic that may be of particular interest when examining relationship distress and cortisol functioning. This pattern could easily be classified as one of the “hostile communication patterns within the context of close relationships” that influences physiological responses (Dickerson, 2011, p. 84). The demand/withdraw sequence likely solicits physiological responses because it is one of the specific relational dynamics that results in threatening emotions linked with HPA activation (e.g., a sense of loneliness, anger, a fear of rejection or negative perception by one’s partner, lack of control; Dickerson & Zocolla, 2013; Furrow & Bradley, 2011; Johnson, 2004; Papp et al., 2009). Consequently, when partners engage in this relationship dynamic, they often experience factors that are associated with heightened cortisol responses (Dickerson, 2011; Dickerson & Zocolla, 2013).

Knowing that the demand/withdraw pattern is a specific relationship factor that may lead to aberrant cortisol functioning, it is possible that EFT could be particularly efficacious for improving cortisol functioning among distressed couples. This may be the case because the model’s initial stage of treatment focuses on identifying and altering negative interaction patterns (e.g., demand/withdraw; Johnson, 2004), so it is likely that some of the specific relational dynamics that are linked to aberrant cortisol functioning among distressed couples are being addressed at the onset of treatment. Consequently, when compared to other treatments, EFT could be particularly effective at improving cortisol functioning in distressed couples because of its heavy focus on some of the specific dynamics that often result in relationship distress.

Considering the physiological reactions that occur in the face of threatening emotions, as well as the specific link between demand/withdraw and heightened cortisol responses, Social Self Preservation Theory provides a conceptual framework regarding some of the components of marital distress (i.e., threat of rejection, being perceived negatively by one's partner, feeling a lack of control, and the demand/withdraw pattern) that become mechanisms for aberrant cortisol functioning. Such linkages also point to the potential for interventions focused on interrupting these negative interactions (i.e., EFT) as means for improving cortisol functioning.

**Damaging Effects of Cortisol**

The associations between relationship distress and aberrant cortisol functioning are concerning because of the deterioration in physical and emotional health that can result from continually impaired cortisol functioning. Poor cortisol functioning contributes to a number of health concerns, including decreased immune functioning, immune system dysregulation, lowered metabolism, higher blood pressure, increased heart rate, osteoporosis, cardiovascular disease, abdominal obesity, and prolonged wound healing (Ebrecht et al., 2004; Glaser & Kiecolt-Glaser, 1994; Gruenewald et al., 2006; Kiecolt-Glaser & Newton, 2001; Lovallo, 2005; Malarkey, Glaser, Kiecolt-Glaser, & Marucha, 2001; McEwen, 1998). In addition to its negative impact on physical health, aberrant cortisol secretion also negatively impacts mental health, including worsened depression (Burke, Davis, Otte, & Mohr, 2005), as well as memory and learning deficits (Malarkey et al., 2001).

While it is difficult to fully estimate the expenses resulting from poor cortisol functioning due to relationship distress, examining the costs of just a few problems that are causally linked to cortisol illustrate the potential financial burden indirectly caused by relationship distress. For example, the direct and indirect costs of depression are estimated to be $83.1 billion each year

(Greenberg et al., 2003); the American Heart Association (2006) estimates that cardiovascular disease – just one of the many physical ailments related to aberrant cortisol functioning – results in $457.4 billion annually. Aberrant cortisol functioning is not the sole reason for such conditions, so these figures are not the result of poor cortisol functioning alone; however, the expenses associated with these examples give insight regarding the financial burden of diseases that are, in part, causally linked to poor cortisol functioning. The financial burdens, along with the potential mental and physical health deficits experienced by those with abnormal cortisol functioning, emphasize the importance of understanding factors that influence cortisol secretion and finding interventions that could serve as preventative methods for avoiding such diseases.

**Cortisol**

While cortisol is often used as a physiological marker to examine the effects of stress in general, it is also a common method for examining the impact of relationship distress on an individual's health (e.g. Heffner et al., 2006; Papp, Pendry, Simon, & Adam, 2013; Saxbe & Repetti, 2010). Cortisol is often used to examine the effects of relationship dynamics because the hypothalamic-pituitary-adrenal corticol axis (HPA) – the body's central stress response system and the part of the brain where cortisol is released – is sensitive to social inputs (see Ditzen et al., 2007; Heffner et al., 2004; Kirschbaum et al., 1995; Saxbe & Repetti, 2010). Thus, cortisol functioning provides a means for indirectly observing HPA functioning (Weller et al., 2014), making it an ideal means for understanding the physical effects of relationship distress on one's health. Cortisol is particularly useful in measuring the physical effects of marital distress because the HPA is sensitive to social factors including marital quality and relationship satisfaction (Ditzen et al., 2007; Saxbe & Repetti, 2010). This is supported by additional research showing that when relationships are distressed – or even when partners who generally have high levels of relationship satisfaction experience conflict – the HPA is activated and partners experience impaired cortisol functioning (Burke et al., 2005; Ditzen et al., 2007; Kiecolt-Glaser et al., 1997; Saxbe, et al., 2008).

Activation of the HPA is one part of a larger system that the body uses to handle potential threats or stressful events. The body's response to potential threats, which includes HPA activation, is known as allostasis (Sterling & Eyer, 1988) and is the term used to describe the body's attempt to promote adaptation (McEwen, 1998) and return to homeostasis after responding to a stressful event. This response allows us to adjust to constantly changing circumstances, making it adaptive in the short term (McEwen, 1998). However, while allostasis is helpful for handling stressful situations in the moment they occur, it also comes at a price. When the HPA is activated, less immediate physiological systems, such as immune functioning, are inhibited (McEwen, 1998). Thus, while increased cortisol secretion in the response to threat is helpful and adaptive in the moment, the exposure to repeated stress can become damaging and maladaptive. When the systems that respond to stress are overworked or fail to shut off once the stressful event is over, as can occur in cases of ongoing relationship distress, individuals are prone to experience a number of physiological, mental, and emotional problems (Burke et al., 2005; Gruenewald et al., 2006; Kiecolt-Glaser & Newton, 2001; Malarkey et al., 2001).

Research shows that varying stressors can impact the body's response system differently (e.g., Burke et al., 2005; Gunnar & Vazquez, 2001), creating a complicated picture of what "ideal" cortisol functioning may look like. Typically, cortisol in healthy individuals shows a strong circadian rhythm throughout the day; cortisol levels usually peak just after waking, decrease rapidly during the morning, and then continue to decrease as the day progresses until reaching an evening nadir (Saxbe, 2008; Stone et al., 2001). Thus, a healthy cortisol pattern would include a high peak shortly after awakening (30-45 minutes) and high morning levels with a steep decline, then lower levels in the afternoon and evening that decline more gradually.

When cortisol functioning is aberrant, it is typically described as either *hyper*cortisolism and *hypo*cortisolism. Each is a response to stress, but research suggests that the nature and timing of the stressor can yield varying results (Miller, Chen, & Zhou, 2007). Overall, when a stressor is first introduced, an individual experiences heightened cortisol excretion. As time passes, however, cortisol secretion may drop below normal levels, as has been observed among individuals experiencing PTSD, as well as physical symptoms associated with early adverse life experiences, such as chronic pain or fibromyalgia (see Gunnar & Vazquez, 2001). On the other hand, chronic stressors that are still present in the person's environment (e.g., unemployment, a distressed marriage) typically lead to significantly higher cortisol levels (Miller et al., 2007).

While initial cortisol levels among individuals who face constant stress can be higher overall (Giese-Davis et al., 2004; Heim, Ehlert, & Hellhammer, 2000; Saxbe, Repetti, & Nishina, 2008; Stone et al., 2001), these individuals often have lower levels for their morning peak and experience less decline in their cortisol levels throughout the day, resulting in a flattened diurnal slope (Miller et al., 2007). This pattern of lower morning levels of cortisol and a gradual (versus a steep) decline throughout the day, signals a "weak" basal cortisol rhythm (McEwen, 1998). Thus, individuals faced with chronic stress, as can happen in a distressed marriage, might exhibit a weak basal cortisol rhythm as their bodies are trying to respond to the ongoing stress of a distressed relationship. So, even though their cortisol levels might be lower during certain points of the day than those with normative diurnal rhythms, their overall cortisol output is greater and the slope is less steep – both of which signal aberrant functioning.

**Negative Relationship Factors and Cortisol**

Numerous studies have linked negative relationship factors with aberrant cortisol functioning. In laboratory settings, researchers found that when participants were assigned a problem-solving task, inadequate amounts of social support from one's romantic partner were associated with heightened cortisol responses (Seeman, McEwen, Singer, Albert, & Rowe, 1997; Uchino, Cacioppo, Kiecolt-Glaser, 1996). Beyond a laboratory setting, negative behaviors during marital conflict have been linked to impaired cortisol functioning over time (Robles & Kiecolt-Glaser, 2003). Distressed couples may be particularly prone to experience aberrant cortisol functioning because distressed relationships often include relationship dynamics (e.g. loneliness; Furrow & Bradley 2011; Johnson, 2004) that are associated with poor cortisol functioning (Papp et al., 2013). Indeed, relationship factors such as cynicism, anger, conflict, and hostility, are associated with aberrant cortisol functioning (Cacioppo et al., 2000; Kiecolt-Glaser et al., 1997; Miller, Dopp, Myers, Stevens, & Fahey, 1999; Pope & Smith, 1991; Ranjit et al., 2009). This is worrisome, as a distressed marriage can deteriorate one's health because of interactions that lead to increased stress responses (Kiecolt-Glaser et al., 2003).

**Demand/withdraw and cortisol.** The demand/withdraw sequence is a particularly concerning relationship dynamic when it comes to understanding the influence of relationship distress on cortisol functioning. This pattern is often present in distressed relationships (Johnson, 2004) and occurs when one partner makes an effort to discuss a problem, while the other partner avoids the issue or makes attempts to end the discussion (Christensen, 1988). Such sequences are classified as one of the most destructive and least effective interaction patterns that couples engage in when trying to solve a problem or address an issue (Heavey, Layne, & Christensen, 1993; Gottman, Coan, Carrere, & Swanson, 1998). Considering this, it is not surprising that this pattern of interaction is associated with greater marital distress (Christensen, 1987; Heavey et al., 1993; Guay, Boisvert, & Freeston, 2003).

The demand/withdraw sequence is of particular concern because of its influence on cortisol functioning. As mentioned previously, this specific relationship dynamic likely leads to HPA activation because of the emotions and threat to self that it may elicit. This notion is supported by research showing that the demand/withdraw sequence results in increased cortisol secretion. This is true for both men and women (Brooks, Robles, & Schetter, 2011), and has been found among newlywed (Kiecolt-Glaser et al., 1996) as well as older couples (Heffner et al., 2006). These findings highlight the considerable impact that distress in romantic relationships can have on cortisol functioning, and help identify a specific relationship dynamic whereby distress may result in aberrant cortisol functioning.

**Gender Differences in Relationship Factors and Cortisol Functioning**

Even though relationship variables impact cortisol functioning among both men and women (Adam & Gunnar, 2001; Barnett, Steptoe, & Gareis, 2005; Heffner et al., 2004), some research suggests that marital factors may impact women's cortisol functioning more than men's (Heffner et al., 2004; Kiecolt-Glaser et al., 1997; Saxbe et al., 2008). This is likely due to gender differences in HPA responses to stress (Goel, Workman, Lee, Innala, & Viau, 2014; Kudielka & Kirschbaum, 2005). In one study, the moderating effect of marital satisfaction on the relationship between work stress and cortisol secretion was examined (Saxbe et al., 2008). Results show that women who reported higher levels of martial satisfaction experienced a steeper decline in their cortisol levels throughout the day than those in less satisfying marriages. Also, when women in more satisfied marriages experienced a stressful day at work, they recovered more quickly than those in less satisfying marriages; women in less satisfying marriages had higher cortisol levels in the evening, suggesting that they had not yet recovered from the work stress they experienced earlier that day. Marital satisfaction was also significantly associated with a stronger basal cortisol cycle for women, but not men (Saxbe et al., 2008), suggesting that women's cortisol functioning may be influenced more heavily by relationship factors than men's.

Other research has less clear results. In their study examining cortisol functioning among newlyweds and older couples who engaged in a 30 minute, conflictual discussion, Heffner et al. (2004) found that greater satisfaction with spousal support resulted in smaller changes in cortisol levels among newlywed women, but not men. However, the older couples in the study were effected by conflict differently – older men with lower spousal support satisfaction exhibited increased cortisol responses, but their wives did not. Additionally, a number of the studies cited previously show significant findings among relationship factors and cortisol functioning for men and women, so it is still unclear what impact gender may have on these variables. While many studies have only included women (e.g., Adam & Gunnar, 2001; Vedhara, Tuinstra, Miles, Sanderman, & Ranchor, 2006), a strength of this study is its inclusion of both men and women in hopes of providing clarity regarding the role of gender in cortisol functioning among distressed couples.

**Couple Therapy and Cortisol**

Improving romantic relationships through couple therapy may be one method for improving cortisol functioning among distressed couples. Many distressed couples seek help through marital therapy and numerous studies have shown that this is an effective means for reducing relationship distress (Johnson et al., 1999; Snyder, Castellani, & Whisman, 2006). One review estimates that approximately 70% of couples report experiencing positive changes upon treatment completion (Lebow et al., 2012) and additional studies show that the majority of couples who participate in couple therapy are no longer clinically distressed at treatment completion (Baucom, Shoham, Mueser, Daiuto, & Stickle, 1998; Halford, Sanders, & Behrens, 1993; Johnson et al., 1999). Considering the efficacy of couple therapy, it may be a feasible option for effectively improving cortisol functioning in distressed couples; not only would stressors be potentially reduced or eliminated, but a close and satisfied relationship can serve as a source of support (Johnson, 2004), and moderate the effects of autonomic stress responses (Coan, Schaefer, & Davidson, 2006; Johnson et al., 2013).

**Emotionally Focused Couples Therapy.** Emotionally Focused Couples Therapy (EFT) has been established as a particularly effective treatment method for distressed couples (Burgess et al., 2015; Dalgleish et al., 2015; Denton, Burleson, Clark, Rodriguez, & Hobbs, 2000; Johnson & Talitman, 1997; Johnson et al., 1999; Lebow et al., 2012; Makinen & Johnson, 2006; Wood, Crane, Schaalje, & Law, 2005). Research examining the efficacy of EFT shows that 70-73% of couples who were initially distressed were considered non-distressed upon treatment completion, and that 86% of participants experience significant improvements in their relationship (Johnson et al., 1999). Among distressed couples, EFT has also been found to be more efficacious in increasing marital satisfaction compared to couples who receive alternate forms of treatment (Byrne, Carr, Clark, 2004; Johnson & Greenberg, 1985; Wood et al., 2005).

While EFT has been established as an effective model for helping distressed couples, it may also be particularly efficacious in improving cortisol functioning. The efficacy of EFT as a model would suggest it may be an effective means for improving cortisol functioning simply by its ability to improve romantic relationships; it is also possible that this model might influence cortisol levels in distressed couples because in its initial stage, EFT focuses on helping couples identify their negative interaction patterns (Johnson et al., 1999), which typically consist of a demand/withdraw interaction cycle (Johnson, 2004). Once a couple's negative interaction cycle has been identified, this stage is also characterized by deescalating the demand/withdraw cycle as couples become aware of their underlying emotions and relational needs (Johnson, 2004). By recognizing the factors that contribute to their demand/withdraw cycle, partners' positions in their cycle begin to shift and they become less reactive and begin to feel more secure (Furrow & Bradley, 2011). Thus EFT, with its initial focus on identifying and addressing the demand/withdraw pattern, may be more effective than other forms of couple therapy in improving cortisol functioning among distressed couples, as the demand/withdraw pattern has been identified as a specific component through which relationship distress contributes to poorer cortisol functioning (Heffner et al., 2006; Kiecolt-Glaser et al., 1996).

### Current Study

Despite the strong foundation offered by previous research regarding the negative effects of marital distress on cortisol functioning, as well as the efficacy of couple therapy in reducing relationship distress, no study to date has explicitly examined the effectiveness of a specific form of therapy in improving cortisol functioning. Consequently, the aim of this study is to examine the effectiveness of EFT versus TAU in improving cortisol functioning. Given the empirical evidence that EFT is a particularly efficacious model in reducing relational distress, and its focus on deescalating the demand/withdraw pattern, we hypothesize that couples in the EFT group will show better posttreatment cortisol functioning than those in the TAU group. Additionally, the interaction between treatment group and gender will also be examined in an effort to provide greater clarity regarding the role of gender in cortisol functioning among distressed couples.

## Methods

### Participants

The data for this study were taken from information gathered as part of a marital intervention study. The sample for this study consists of 60 heterosexual, married couples. Couples were recruited from the community using paid advertising, flyers, and advertising at a university mental health clinic. All of the couples that received therapy were actively seeking treatment. Of the couples that participated in therapy, 20 received EFT and 40 received unspecified treatment based on the individual therapists' preference (i.e. TAU). Because EFT was added to the study at a later time point, there was a need for more participants in this group, so couples were not randomly assigned to treatment. Overall, participants had been married about 5 years, had completed some college, and were predominately Caucasian (see Table 1).

Because the larger intervention study examined a number of health markers, couples interested in study participation were excluded if either spouse was taking medication(s) that impact blood pressure or if s/he had a chronic illness that influenced cardiovascular functioning. Couples were also excluded from the study if the wife was pregnant, breast feeding, planning on becoming pregnant in the next three months, or had given birth within the last six months. Those who were interested in the study but excluded from participation were still offered therapy.

**Procedure**

Couples included in the study completed an informed consent form and were given a variety of questionnaires to fill out. This packet of assessments measured demographic variables, physical health (i.e. health history and sleep habits), mental health, and relationship functioning. Participants were also taught how to properly conduct saliva samples over a 24-hour period using salivettes. After 24 hours from this initial meeting, participants returned their completed saliva samples and questionnaires to the research lab. For the purposes of this study, measures used to assess relationship satisfaction and cortisol were included.

**Measures**

**Dyadic Adjustment Scale.** Relationship satisfaction was measured using the Dyadic Adjustment Scale (DAS; Spanier, 1976). The DAS, with high reliability and validity (Carey, Spector, Lantinga, & Krauss, 1993; Spanier & Thompson, 1982; South, Krueger, & Iacono, 2009), consists of four subscales that measure dyadic consensus, satisfaction, and cohesion as well as affectional expression. The dyadic consensus scale consists of 13 items that assess the degree to which partners agree or disagree regarding a variety of issues (e.g. religious matters, friends, household tasks). Dyadic satisfaction is measured using 10 questions that assess the how satisfied the respondent is with the relationship (e.g. the frequency that the couple has considered separation, quarrels, confides in one another, think things are going well). To measure dyadic cohesion, couples respond to 5 questions examining the degree to which the respondent and his/her partner engage in activities together (e.g. working on a project, laughing). Affectional expression is assessed using 4 items that examine the degree to which the respondent agrees with the partner concerning emotional affection (e.g. showing love, kissing) expressed between partners. Reponses are selected from Likert scales, with answers ranging from 1-5 or 1-6, depending on the subscale. The 32 items that the DAS is comprised of are then summed; total scores range from 0 to 151, with higher scores indicating better dyadic adjustment (Spanier, 1976). Cut off scores are used to identify couples that are considered clinically distressed (92 or less) and non-distressed (107 or greater; Crane, Allgood, Larson, & Griffin, 1990; Sabourin, Valois, & Lussier, 2005).

**Cortisol sampling.** Cortisol assessment was conducted via saliva sampling. This calculation is a common method used to determine an average level of daily cortisol secretion (Adam & Kumari, 2009). Samples were gathered using a standard sampling product (Salivette, Sarstedt, Inc., Newton, North Carolina) and were collected approximately at 7 am, noon, 5 pm, 10 pm, and immediately in the morning of the following day (i.e., when participants awoke but were still in bed; see Figures 1 and 2). Multiple time points were used to account for diurnal effects typical of cortisol levels (Kirschbaum & Hellhammer, 1994). Samples were stored in a freezer set at -20°C until they were sent to be assayed. Samples were examined using a commercial immunoassay with chemiluminescence detection (CLIA, IBL-Hamburg, Germany).

Prior to beginning the study, participants were directed to chew or suck on a cotton roll for about 2-3 minutes, until it was completely saturated. They were then told to place the cotton roll in a retainer and then in a centrifuge tube. In an effort to minimize potential contamination, participants were instructed to thoroughly rinse their mouths with water 10 minutes prior to collecting a saliva sample. They were also directed to avoid consumption of a major meal one hour prior to saliva sampling, as well as any dairy products 30 minutes prior to sampling. Participants were also instructed to avoid instructed to avoid alcohol 24 hours prior to saliva collection. Additionally, participants were instructed not to brush their teeth 3 hours prior to sampling, as this may lead to blood contamination.

**Cortisol indices.** While it was initially assumed that lower levels of cortisol signaled healthier functioning (see Miller et al., 2007; Saxbe, 2008), this is not necessarily the case. Because of the diurnal rhythm of cortisol functioning (e.g., reaching a peak shortly after awakening and then declining at various rates throughout the day), what would be considered a "healthy" cortisol level at any single time point depends on the sampling period during the day. This means that lower levels are not necessarily always better; lower morning levels, for instance, are associated with marital distress and generally are linked to greater total output and flattened slopes (Adam & Gunnar, 2001; Barnett et al., 2005; Saxbe et al., 2008; Vedhara et al.,

2006) – both of which are indicative of aberrant functioning. Because of this, as well as the diurnal rhythm that cortisol follows, indices that consider the total output or that examine specific elements of the diurnal rhythm (e.g., slope) are recommended (Ryan, Booth, Spathis, Mollart, & Clow, 2016), as they may provide a more complete picture of overall functioning than a single time point.

Currently, there are five commonly used indices used for examining cortisol functioning (see Saxbe, 2008), with research suggesting that each measures a potentially different aspect of HPA activation, and thus yields varying results (see Golden et al., 2013; Pruessner, Kirschbaum, Meinlschmid, & Hellhammer, 2003; Saxbe, 2008; Vedhara et al., 2006). Recent research on the consensus of cortisol functioning also supports this and recommends using multiple indices of cortisol functioning (Ryan et al., 2016). Consequently, this study included a variety of indices of cortisol functioning to gain a more complete picture of how treatment might impact it. Separate analyses were conducted for each index (e.g., a two-way ANCOVA was conducted for slope, a separate two-way ANCOVA was conducted for $AUC_G$).

***Area under the curve.*** Following the recommendations of Pruessner et al. (2003), two methods for calculating area under the curve (AUC) were used – area under the curve with respect to ground ($AUC_G$), which captures total cortisol output on a given day, as well as area under the curve with respect to increase ($AUC_I$), which focuses on reactivity of the HPA axis throughout the day. Both of these indices provide a cumulative index that is based on multiple measurements collected over time and takes into account the circadian changes that are typical of cortisol secretion (Pruessner et al., 2003). They were calculated using the formulas outlined by Pruessner et al. (2003).

***Slope.*** Slope is a commonly used method for examining cortisol functioning (see Saxbe, 2008). Based on previous research (see Ranjit et al., 2009), Golden and colleagues (2013) recommend using two possibilities for calculating slope: examining the “early decline” which is calculated from 30 minutes post awakening to two hours after awakening, and “late decline” which uses all time points available from 2 hours after awakening up to 16 hours post awakening. Based on the nature of the data collected for this study, calculating the early decline was not an option, so the time points for calculating the late decline were used. The first collection point, which was collected between 7 and 9 am, provides an approximation for cortisol levels two hours after participants awoke, and the values collected at noon, 5 pm, and 10 pm were also included.

***Single time point.*** While not commonly used because of the diurnal rhythm of cortisol, single time points have been used to identify differences in cortisol functioning between different groups (e.g., divorcing women had higher night time cortisol than stably married women; Powell et al., 2002; see also Cohen et al., 2006; Grossi, Perski, Lundberg, & Soares, 2001). Because higher afternoon and evening values are associated with higher overall cortisol levels (Miller et al., 2007), examining differences among a single time point can provide useful information about cortisol functioning. Bedtime (10 pm) cortisol levels were used for the single time point analyses because this time point has been identified as the most highly associated with total, daily cortisol output (Golden et al., 2013).

**EFT Intervention**

EFT is a manualized treatment method that utilizes attachment theory to understand relationship distress (Johnson, 2003). In this model, distress is conceptualized as a result of partners experiencing disconnection and having unmet attachment needs (Johnson, 2004). If individuals perceive their partner as lacking accessibility and responsiveness, they may adopt coping strategies that create additional distress and perpetuate negative marital interactions, such as demand/withdraw patterns (Gottman et al., 1998).

In the beginning phase of EFT, the therapist focuses on identifying a couple's demand/withdraw pattern. Partners become aware of their own emotions that serve as the driving force behind their cycle. Emphasis is also placed on externalizing the cycle that the couple is caught in. This allows the couple to work together toward defeating a common enemy – their pattern of demand/withdraw that perpetuates their distress and heightens their attachment fears (Johnson, 2004). In the following stage of EFT, the therapist helps partners to recognize and express their attachment fears and needs in a way that facilitates closeness and increased connection. Finally, effort is made to help couples identify changes they have made in therapy that have created a new relationship characterized by accessibility, responsiveness, and engagement (Feeney & Thrush, 2010; Johnson, 2003).

**Fidelity to treatment.** Therapist fidelity describes how well a therapist delivers a model's interventions, as well as how well s/he implements the model in accordance with how the developers intended it to be used (Ryan, Conti, & Simons, 2013; Sechrest et al., 1979). For this study, fidelity was monitored through bimonthly supervision with an EFT-certified supervisor. In these meetings, therapists had the opportunity to consult with the supervisor on their cases and identify potential barriers to therapy fidelity. These meetings were also used to help students conceptualize the steps and stages of EFT to ensure that therapists were following the treatment as outlined.

Fidelity to the EFT model was assessed using the Emotionally Focused Therapy – Therapist Fidelity Scale (EFT-TFS; Denton, Johnson, & Burleson, 2009). This validated measure identifies 13 skills that are fundamental to implementing EFT, such as validation of each partner, processing emotion, and use of enactments. Each of the 13 skills is scored by a trained rater using a 5-point Likert scale; the anchors on the scoring sheet are 1 – poor demonstration of skill, 3 – adequate demonstration, and 5 – exemplary demonstration. Denton and colleagues (2009) determined that a score of 39 would serve as the cutoff for adequate fidelity to the model, as this would indicate an average score of "3" or adequate implementation of the skill. Following these guidelines, all cases included in this study met the criterion for adequate treatment fidelity (Sandberg et al., 2015).

**Control Variables**

Pre-treatment cortisol levels were included as a control variable. These measures were also calculated using the different indices, and each Time 1 index was used as a control with the corresponding Time 2 index (e.g., $AUC_G$ calculated from pretreatment scores was used as a control when examining $AUC_G$ posttreatment cortisol functioning).

**Analytic Strategy**

In order to analyze changes in cortisol functioning according to treatment type and gender, while controlling for pretreatment cortisol functioning, a two-way analysis of variance (two-way ANCOVA) was conducted (Johnson & Miller, 2014); participants' results will be examined according to treatment type (EFT and TAU) as well as gender and post-treatment cortisol levels will serve as the outcome variable. A two-way ANCOVA allows for the examination of the influence of main effects (i.e., the effect of each independent variable separately – treatment type and cortisol functioning as well as gender and cortisol functioning) on posttreatment cortisol functioning, as well as the examination of an interaction effect, to determine if treatment type *and* gender predict cortisol functioning (see Johnson & Miller, 2014, p. 320).

# Results

## Preliminary Analyses

All analyses were conducted using SPSS 23. Data were graphed in a line plot for Time 1 and Time 2 cortisol measures. A total of five cases (four at Time 1 and one at Time 2) were identified as outliers based on a sharp, unexpected increase in cortisol levels during the afternoon and evening measurements that were near or exceeding the morning levels (awakening and 7 am). These unusual patterns may have been due to irregular sleep schedules or errors in data collection or entry. Because none of these cases had unusual data for both Time 1 and Time 2, just the values for the time point that seemed unusual (e.g., all of the measures for a given case at Time 1) were removed and the values for the alternate time point were left as part of the dataset. After these measurements were removed, the distribution of the remaining data was examined because a normal distribution of the data is an assumption of conducting a general linear model. When plotted, the data were positively skewed at four of the five time points, and results from the Shapiro-Wilk test indicated that the skewness was significant. This is somewhat expected, as the typical diurnal profile could be approximated by an exponential curve. Thus, modeling after the procedures used in several articles (e.g., Golden et al., 2013; Golden et al., 2014; Miller et al., 2007), the raw values were log transformed prior to calculating cortisol indices. Initially, the natural log was used, but the data were still significantly skewed, so a log base 2, which yielded more normal distributions, was used. Outlying values that were three standard deviations beyond the mean were removed. This resulted in normally distributed data for most of the time points. Results from Levene's Test of Equality of Variances show homogeneity of variance for three of the four indices (*p*=0.21 for $AUC_G$, *p*=0.40 for $AUC_I$, *p*=0.74 for Slope, and *p*<0.00 for 10 pm sample).

Prior to completing the steps listed above (i.e., before deleting any cases), patterns for missingness were analyzed using Little's (1988) MCAR test; a nonsignificant result suggests that the data are Missing Completely At Random (MCAR), which was the case with these data (chi-square = 68.357, DF = 70, $p$ = .533). Analyses of missing data showed that a considerable portion of the data were missing for Time 2 cortisol (37.5% of scores were missing among the five time points). Multiple imputation was used to address this. Following the recommendation of Graham, Olchowski, and Gilreath (2007), 50 iterations were used on the log transformed values in order to generate the data that were used to calculate each cortisol index (Walker et al., 2010). The pooled results for each cortisol index are reported below.

Independent *t*-tests were conducted to determine if there were differences among couples in EFT and those in TAU for the varying cortisol indices at posttreatment (Johnson & Miller, 2014). Overall, the results suggest that there were significant differences between treatment groups in posttreatment cortisol functioning for three of the four indices (see Table 2). Of the indices that yielded significant group differences, couples in the EFT group had slightly higher evening levels, less daily reactivity as measured by $AUC_I$, and more flattened slopes, albeit minimally. These results suggest that couples in EFT may have had more aberrant cortisol functioning than those in TAU.

Independent *t*-tests were also used to determine if there were significant differences between men and women for the varying cortisol indices at posttreatment. Results suggest that there were significant differences in posttreatment cortisol functioning as measured by all four indices (see Table 2), with men showing overall improved functioning over women. Women had slightly higher evening levels, higher total output, less reactivity during the day. However, men had a more flattened slope than women, although this difference was quite minimal.

Paired-samples *t*-tests were also conducted for each index to determine if cortisol functioning changed significantly from pre- to posttreatment among the two treatment groups and genders (Johnson & Miller, 2014). There was a significant difference in cortisol functioning among couples participating in TAU for each of the four indices; this was also true for couples who received EFT (see Table 3). Additionally, both men and women had significant differences between their pre- and posttreatment cortisol functioning among all four indices. The EFT group differed from the TAU group in that their $AUC_G$ levels decreased from pre- to posttreatment, which may suggest improved cortisol functioning. Aside from this difference, all other results indicate potentially worsened cortisol functioning for both treatment groups and genders; they showed an increase in their evening levels, greater total output (higher $AUC_G$; with the exception of the EFT group), less reactivity (lower $AUC_I$), and slightly flattened slopes.

Additionally, because a general assumption of this study is that treatment impacts cortisol functioning by improving relationship functioning, paired-samples *t*-tests were also conducted for scores from the DAS to determine if relationship functioning changed significantly from pre- to posttreatment among the two treatment groups. Results from these analyses suggest that couples did significantly differ in their pre- and posttreatment relationship functioning, with both groups showing improved relationship satisfaction (see Table 3).

**Main Model**

Building on these preliminary analyses, two-way ANCOVAs were then conducted to analyze the effect of gender and treatment type on each index of cortisol functioning. Results show that there was not a statistically significant interaction between treatment type and gender for any of the cortisol indices [$AUC_G$, $F$ (1, 55) = 0.935, $p$=0.34; $AUC_I$, $F$ (1, 62) = 0.12, $p$=0.73; Slope, $F$ (1, 66) = 0.362, $p$=.55; Single time point, $F$ (1, 6071) = 0.145, $p$=0.70]. Additionally, results from the main effects show that none of the indices were significantly associated with treatment type ($AUC_G$, $p$=0.63; $AUC_I$, $p$=0.66; Slope, $p$=0.23; Single time point, $p$=0.09) and that only the bedtime measure of cortisol was significantly linked with gender ($AUC_G$, $p$=0.48; $AUC_I$, $p$=0.64; Slope, $p$=0.73; Single time point, $p$=0.001). The control variable, cortisol at pretreatment, was also significant for each index ($AUC_G$, $p$=0.008; Slope, $p$=0.008; Single time point, $p$<0.0001), with the exception of $AUC_I$, $p$=0.16).

## Discussion

The aim of this study was to determine if cortisol functioning among distressed couples differed by treatment type (EFT versus TAU), as well as gender. This was tested using a two-way ANCOVA, where pretreatment cortisol levels were controlled for and main as well as interaction effects were tested. The t from this study suggest that overall, there are no significant main or interaction effects in cortisol functioning. That is to say, the differences between the groups that were found from the preliminary analyses conducted for this study do not seem to be explained by gender nor treatment type. While the preliminary analyses conducted for this study do suggest that there are significant differences between pre- and posttreatment cortisol functioning, these findings are somewhat mixed, making their interpretation unclear. Findings for each index, as well as their possible meaning concerning the impact of couple therapy, are discussed below.

### Slope

While both groups did show significant differences in slope from pre- to posttreatment, the change in slope is quite minimal (see Table 3). Ultimately, the minor changes in slope values make it difficult to draw much meaning from this index. That being said, the slopes for both groups became slightly less steep, suggesting a flatter diurnal curve, which is indicative of worsened cortisol functioning (Ryan et al., 2016). Some research suggests that couples receiving therapy feel like their relationship worsens before it improves (Davis & Piercy, 2007), so the flattened slopes may have correlated with an initial decrease in relationship satisfaction, although this was not reflected in couples' DAS scores.

The results from pre- and posttreatment DAS scores may provide some insight as to why cortisol functioning seemed to have worsened. While the results from the paired samples *t*-tests did show a significant difference between pre- and posttreatment relationship satisfaction, the clinical significance of these changes is questionable. Research suggests that a 12-point change in DAS scores indicates clinically meaningful change (Jacobson & Truax, 1991); the DAS scores for both groups suggest that while there was statistically significant change from pre- to posttreatment, this change may not have been clinically significant. Furthermore, the average posttreatment DAS scores still place both groups in the distressed range (see Table 3). While improving and yet in the distressed range, it is possible that couples may have recognized their inability to control outcomes – a factor that has been linked with aberrant cortisol functioning (Dickerson & Zoccola, 2013) – as they participated in couple therapy, but did not see immediate or marked improvements in their relationship. Indeed, they may have felt an even stronger sense that they could not "succeed despite their best efforts" (Dickerson & Kemeny, 2004, p. 358) than prior to starting therapy because they were now actively taking steps to improve their relationship, but perhaps were still in the it gets worse before it gets better phase (Davis & Piercy, 2007). With the links between certain emotional responses and cortisol functioning identified by Social Self Preservation Theory, it is plausible that participants were experiencing some of the negative emotions linked with worsened cortisol functioning (Dickerson & Zoccola, 2013) which may have resulted in a flattened diurnal slope (Saxbe, 2008).

**Area Under the Curve**

Results from the paired samples *t*-tests suggest that the differences between treatment groups for the AUC indices were mixed; couples in the EFT group showed a decrease in both of the AUC indices, whereas couples in TAU experienced an increase in $AUC_G$, but a decrease in their $AUC_I$. For gender differences, there seems to be a consistent pattern of worsened functioning, as both groups showed an increase in total output, as measured by $AUC_G$, and less daily reactivity, as indicated by $AUC_I$. Previous research suggests that $AUC_G$ and $AUC_I$ may have an inverse relationship, where greater $AUC_I$ is associated with lower $AUC_G$ (Vedhara et al., 2006). This study also found that an increased $AUC_I$ was linked with a more normal pattern of cortisol functioning. The findings from this study focused on women with breast cancer and a control group; while this is clearly a different population than the participants used in this study, women with breast cancer may be somewhat similar to distressed couples in that both are faced with a longterm stressor that is continually present. The interpretation of these findings is somewhat tentative, however, because of the lack of foundational research providing typical profiles of distressed couples and thus, a lack of clarity regarding what direction of change in $AUC_G$ and $AUC_I$ would indicate improved functioning.

Similarly, the meaning of the $AUC_G$ differences found between treatment groups is difficult to interpret because it is unclear whether an increase or decrease in total cortisol output signifies improvement. For example, an increase in $AUC_G$ has been linked with improved functioning (Fiorentino, Saxbe, Alessi, Woods, & Martin, 2012), which some research suggests may be a result of a person feeling more in control and able to handle the stresses of the day

(Saxbe, 2008). So, it might be that as couples worked on their relationship and felt it was improving, they may have shown an increase in cortisol output as they prepared for the challenges in their relationship with a sense that they could handle them more effectively and with greater control. Yet, research also suggests that when individuals face a chronic stressor that is still present (as would be the case in a distressed relationship), this also results in higher overall cortisol output (Miller et al., 2007), so it is possible that couples showed an increase in their cortisol output in the face of continued relationship distress. Overall, these findings point to the complex nature of cortisol functioning and the variability in interpreting the findings from this study. Because it is unclear what cortisol functioning looks like among couples experiencing distress, it is difficult to say if increases or decreases in AUC signify improvement.

Part of the difficulty in determining which direction of change signifies improvement is not knowing how long couples have been distressed and a lack of clarity regarding what cortisol functioning among couples who have experienced varying lengths of distress look like. Without having a general foundation of cortisol functioning among varying lengths of distress, it is uncertain what changes researchers might expect in cortisol functioning if treatment does help resolve relationship distress. The influence of time since the onset of distress may be key in understanding and interpreting changes in cortisol functioning among distressed couples because distressed couples could either have lower or higher levels of cortisol output. For example, some of the emotions that may result from relationship distress (e.g., shame, a sense of loss), have been linked with initially higher levels of cortisol, but an eventual lower than normal output (see Miller et al., 2007). Higher total output has also been linked with continued exposure to stressors, but research also shows that individuals facing chronic stress (e.g., a caregiver for an ill family member) experience lower than usual cortisol levels (Miller et al., 2007). So, it is unclear if a partner who has been distressed for a longer period of time would have lower than normal cortisol levels (as may result from feeling shame, rejection, etc.) or higher levels because s/he is still in the presence of the stressor (i.e., the distressed relationship). These mixed findings point to potential variability in interpreting this study's results and highlight the need for future research to identify cortisol profiles among distressed couples to determine what direction of change would signify improvement. Doing so would be helpful for informing the results of future research examining the impact of therapy on cortisol functioning.

**Single Time Point**

The only exception to the null findings was with gender and bedtime cortisol levels. While this result may point to gender differences, it is hard to interpret this finding when the other three indices – all of which arguably provide a more complete and accurate measure of overall cortisol functioning (see Saxbe, 2008; Ryan et al., 2016) – showed no significant link between gender and cortisol. Because the use of a single time point for assessing cortisol is less reliable than measures which account for the diurnal rhythm of cortisol functioning (i.e., slope or AUC; Pruessner et al., 1997), it is difficult to place much weight on this finding when the other indices showed no such association. The lack of consistency between the indices regarding this link suggests that perhaps the finding regarding the evening sample it is due to variance in sampling rather than an actual effect. Also, this index is limited because while some research suggests that bedtime cortisol levels may be most closely associated with overall cortisol output experienced during the day (Miller et al., 2007), other research suggests that cortisol samples collected later in the day can reflect more state variance (e.g., exercise, acute stressors) than trait changes (Kirschbaum et al., 1990), so the differences found in this study may be due to temporary events or stressors and not actual differences in relationship functioning. Research also suggests that morning values are more consistent and reliable than afternoon and evening values, so future research may consider using this time point rather than evening values.

**Limitations and Future Directions**

**Challenges of cortisol field research.** Field research is extremely beneficial because of its aim to provide a more complete picture of individuals' day-to-day functioning than what might be seen in laboratory settings. Despite this, it can present some unique difficulties, especially when researchers are trying to collect information that is as variable as cortisol functioning. Thus, because of the naturalistic nature of the data collection used for this study, there are some potential methodological challenges that result from the limited ability to ensure participant adherence to study protocol. This issue is concerning, as noncompliance with sampling time instructions is associated with significantly different results in cortisol profiles (Kudielka, Broderick, & Kirschbaum, 2003).

The rate of noncompliance is also worrisome. In studies that used electronic monitoring devices to evaluate participant adherence, rates for noncompliance for at least one time point range between 26-44% (Golden et al., 2014; Kudielka et al., 2003; Kudielka, Hawkley, Adam, Cacioppo, 2007); in on study, of those that failed to comply, 82% did so at two or more timepoints (Kudielka et al., 2003). In another study, nearly 44% of participants failed to provide samples within 10 minutes of the requested time (Golden et al., 2014) – an issue that could drastically impact results depending on the time sample being collected. These rates are concerning because of their potential to affect results; one of the studies with an overall compliance rate of 84% still found that this yielded significantly different results (Kudielka et al., 2003). While research suggests that noncompliance does not impact indices such as AUC and slope (Golden et al., 2014), other research shows that it is significantly linked with differing daily profiles (Kudielka et al., 2003) and slopes (Broderick, Arnold, Kudielka, Kirschbaum, 2004), so it is possible that this was an issue with the current study as well.

Specific to this study, the nature of data collection may have impacted the values for multiple of the cortisol indices used. Because the first morning sample was completed when participants arrived at the lab, it is uncertain when during participants' morning peak this sample was collected. Considering that cortisol levels typically reach their morning peak 30 to 45 minutes after awakening (Saxbe, 2008; Stone et al., 2001), it is quite possible that the morning peak was missed – a factor that has resulted in significantly different profiles in other research (Kudielka, et al., 2003). This means that the calculations for AUC may be somewhat incomplete because the highest level of cortisol reached during the day may have been missed in sampling. This missing information could substantially effect these values and result in wide variation, even among the same individual, between the pre- and posttreatment samples (i.e., if the same individual collected his/her morning sample at approximately 30 minutes after awakening at pretreatment, but had already been awake for 90 minutes when collecting the same time point at posttreatment, the values for this individual's AUC indices could vary drastically). Additionally, if the morning peak was not captured, the slopes may have appeared flatter than they actually were – a finding that has been verified in other research where participants failed to comply with directions, and thus, missed capturing their peak cortisol level (Kudielka et al., 2003). Thus, it is possible that the results for slope may misrepresent participants' actual cortisol functioning.

Additionally, even though it is common practice (see Ryan et al., 2016), collecting cortisol over a single 24-hour period may be problematic for capturing a complete picture of participants' diurnal rhythm. In a study that focused specifically on optimal data collection and slope calculation, Kraemer and colleagues (2006) recommend that two to three days of data collection be used when calculating slopes because test-retest reliability of slopes was less than ideal when data from only day were used. Research also suggests that feelings of loneliness, sadness, or threat experienced the day before impact the following day's CAR (Adam, Hawkley, Kudielka, & Cacioppo, 2006), so multiple days' worth of samples may provide a more complete picture of cortisol functioning that is less influenced by the events of a single day. Based on these findings, future research could benefit from multiple days' worth of data collection to gain a clearer picture of overall cortisol functioning.

**Better understanding of demand/withdraw and cortisol functioning.** While there are theoretical reasons for expecting EFT to impact the demand/withdraw pattern, and for this to influence cortisol functioning, the findings from this study suggest that the relationship between demand/withdraw and HPA activation is still unclear. While relationship scores did improve, previous research has identified the *perception* of demand/withdraw, not the actual behaviors, as the factor that influenced cortisol responses (Heffner et al., 2006). Considering this, perhaps EFT does result in changes in demand/withdraw behaviors (as the improved relationship scores might suggest), but maybe the amount of time between pre- and posttreatment (only 12 sessions) was not enough time to change participants' perceptions of their marital dynamics, so cortisol functioning was not impacted. Thus, building on the findings from Heffner and colleagues (2006), future research may benefit by examining this aspect of relationship functioning by assessing the influence of specific therapies on perception of demand/withdraw behaviors using self-report measures. This information could then be used to determine if perception of changes in behaviors mediates the relationship between therapy type and changes in cortisol functioning.

Future research may also benefit by focusing on the influence of various types of therapies on specific aspects of relationship distress and cortisol functioning. For example, a future study could test the effects of therapy and gender by following the pattern outlined by studies that have used the Trier Social Stress Test (Kirschbaum, Pirke, & Hellhammer, 1993). This concept could be adapted to distressed couples by having them engage in a discussion focused on a difficult issue at pre- and posttreatment. Measures could be collected to determine if cortisol levels during the discussion, as well as recovery time afterward, are positively impacted after treatment completion and if there are any differences based on the type of treatment received or gender of the participant.

**Additional considerations.** Perhaps the most apparent limitation of this study is the small sample size. Future research would benefit by including more participants when replicating this study. Having an increased sample size could help determine whether interventions at the relationship level can positively impact cortisol functioning. A larger sample size would also allow for the inclusion of various types of therapy (e.g., EFT, IBCT), wherein researchers could compare the impact of varying models of therapy on this important health marker.

Another limitation of this study is that “normal levels” of cortisol functioning can vary between individuals (normal levels taken at 8 am range from 6 to 23 mcg/dL; Wisse, 2015), so it may be difficult to detect meaningful changes in individual functioning when examining changes in an entire population. Because individual changes may be difficult to detect due to the naturally large amount of variation among the population, future researchers might consider using a within-subjects design to better understand individual changes in cortisol functioning over time. Such research may use change scores as the outcome variable in order to account for the large variation on cortisol levels between individuals.

Additionally, while the indices used in this study, as well as the methods for calculating them, are grounded in research, there are potential adjustments that future research may consider.

More recent research has emphasized the benefit of collecting data over numerous days, both at pre- and posttreatment (Ryan et al., 2016). Also, because the slope is one of the optimal options for capturing the diurnal rhythm of cortisol (Ryan et al., 2016), researchers may consider tailoring data collection to more accurately measure this index by including the necessary measures to calculate both the early and late declines (Golden et al., 2013).

Including more indices in future studies might also be beneficial. This is especially true for the cortisol awakening response (CAR) – a commonly used index of cortisol functioning (Saxbe, 2008) that captures a different aspect of HPA functioning than most of the other indices that are commonly used (see Golden et al., 2013). Because this index seems to be linked with anticipation and sense of control over upcoming challenges (Adam et al., 2006), it may be particularly pertinent in investigating the impact of couple therapy; as couple relationships improve, perhaps spouses begin to feel a stronger sense of control, rather than helplessness – emotional dynamics that may impact the CAR (see Saxbe, 2008). This index can be somewhat burdensome because of the numerous and frequent measurements it requires, but future researchers may benefit by focusing on this unique index of cortisol functioning.

## Conclusion

This study focused on understanding the relationship between treatment type and gender and their potential influence on cortisol functioning among distressed couples. Results indicate that neither treatment type nor gender influence posttreatment cortisol functioning. It is recommended that future research first focus on understanding cortisol functioning among distressed couples in general, then use larger sample sizes to be able to compare the potential influence of various treatments in effectively impacting this important health marker.

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Table 1

*Demographic Variables for Sample*

| | Treatment As Usual | | | | Emotionally Focused Therapy | | | |
|---|---|---|---|---|---|---|---|---|
| | Men | | Women | | Men | | Women | |
| | Mean (SD) | | | | Mean (SD) | | | |
| **Variables** | | | | | | | | |
| **Age** (in years) | 28.7 (8.6) | | 28.2 (6.4) | | 35.6 (10.7) | | 32.1 (10.4) | |
| **Weight** (in lbs) | 183.6 (46.9) | | 154.3 (35.1) | | 178.6 (52.3) | | 154.0 (34.9) | |
| **Height** (in inches) | 69.1 (11.4) | | 64.8 (2.5) | | 70.4 (2.6) | | 66.4 (2.8) | |
| **Years of Education** | 15.7 (4.4) | | 15.3 (3.4) | | 15.9 (6.9) | | 15.1 (4.5) | |
| | *n* | % | *n* | % | *n* | % | *n* | % |
| **Years Married** | | | | | | | | |
| 0 – 5 | 27 | 67.5 | 26 | 67.5 | 9 | 45 | 9 | 45 |
| 6 – 10 | 9 | 22.5 | 10 | 25 | 6 | 30 | 6 | 30 |
| 11 – 20 | 3 | 7.5 | 2 | 5 | 1 | 5 | 1 | 5 |
| 20 or more | 1 | 2.5 | 1 | 2.5 | 4 | 20 | 4 | 20 |
| **Annual Income in US $** | | | | | | | | |
| Less than 10,000 | 6 | 15 | 7 | 17.5 | 3 | 15 | 3 | 15 |
| 10,000 – 24,999 | 13 | 32.5 | 13 | 32.5 | 6 | 30 | 5 | 25 |
| 25,000 – 39,999 | 9 | 22.5 | 7 | 17.5 | 1 | 5 | 4 | 20 |
| 40,000 – 54,999 | 3 | 7.5 | 5 | 12.5 | 2 | 10 | 1 | 5 |
| 55,000 – 69,999 | 4 | 10 | 3 | 7.5 | 1 | 5 | 1 | 5 |
| 70,000 – 84,999 | 0 | 0 | 0 | 0 | 2 | 10 | 5 | 25 |
| 85,000 – 99,999 | 1 | 2.5 | 1 | 2.5 | 4 | 20 | 1 | 5 |
| More than 100,000 | 3 | 7.5 | 3 | 7.5 | 1 | 5 | 0 | 0 |
| **Religious Affiliation** | | | | | | | | |
| LDS | 37 | 92.5 | 37 | 92.5 | 19 | 100 | 19 | 95 |
| Other | 2 | 5 | 2 | 5 | 0 | 0 | 1 | 5 |
| **Ethnicity** | | | | | | | | |
| Caucasian | 31 | 77.5 | 28 | 70 | 17 | 85 | 16 | 80 |
| African American | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 5 |
| Hispanic | 5 | 12.5 | 4 | 10 | 1 | 5 | 0 | 0 |
| Asian | 0 | 0 | 1 | 2.5 | 1 | 5 | 0 | 0 |
| Other | 2 | 5 | 6 | 15 | 1 | 5 | 3 | 15 |

*Note*. Values were derived from pretreatment reports.

Table 2

*Independent t-tests by Treatment Group and Gender*

| | TAU | | EFT | | | |
|---|---|---|---|---|---|---|
| **Cortisol Index** | Mean | SD | Mean | SD | t(df) | Sig. |
| $AUC_I$ | 1396.18 | 1446.79 | 1272.72 | 1120.23 | 3.33(118)* | $p < .001$ |
| $AUC_G$ | 2197.51 | 572.28 | 2223.74 | 567.64 | -1.67(118) | $p = .095$ |
| Slope | -0.004 | 0.002 | -0.003 | 0.002 | -9.66(118)* | $p < .0001$ |
| Single Time Point | 0.86 | 1.71 | 1.02 | 1.46 | -3.57(118)* | $p < .0001$ |
| | **Men** | | **Women** | | | |
| **Cortisol Index** | Mean | SD | Mean | SD | t(df) | Sig. |
| $AUC_I$ | 1410.35 | 1373.15 | 1296.61 | 1318.15 | 3.25(118)* | $p < .0001$ |
| $AUC_G$ | 2188.33 | 583.19 | 2225.16 | 556.99 | -2.48(118)* | $p = .013$ |
| Slope | -0.003 | 0.002 | -0.004 | 0.002 | 2.42(118)* | $p < .0001$ |
| Single Time Point | 0.83 | 1.64 | 1.00 | 1.62 | -3.87(118)* | $p = .004$ |

*Note*. Values are derived from posttreatment scores. Units for $AUC_G$ and $AUC_I$ are reported in µg*minutes/dL; slope values are reported in µg/(dL*minutes); single time point units are µg/dL.
* signifies a significant *p*-value.

Table 3

*Paired Samples t-tests for Cortisol and Relationship Satisfaction*

| | TAU | | | | | EFT | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Time 1** | | **Time 2** | | | **Time 1** | | **Time 2** | | |
| **Index** | Mean | SD | Mean | SD | t(df) | Mean | SD | Mean | SD | t(df) |
| $AUC_I$ | 1673.03 | 838.23 | 1397.26[c] | 1445.94 | 11.21(79)* | 1491.99 | 841.82 | 1272.71[c] | 1121.0 | 7.51(39)* |
| $AUC_G$ | 2046.95 | 549.50 | 2197.49+ | 572.43 | -15.18(79)* | 2277.59 | 580.89 | 2223.51[c] | 567.62 | 3.73(39)* |
| Slope | -0.0042 | 0.0014 | -0.0036[a] | 0.0022 | -16.01(80)* | -0.0035 | 0.0016 | -0.0031[a] | 0.0019 | -10.81(40)* |
| Bedtime | 0.40 | 1.17 | 0.86+ | 1.71 | -15.55(80)* | 0.85 | 1.15 | 1.02+ | 1.46 | -4.97(41)* |
| DAS | 91.08 | 10.92 | 96.43+ | 11.13 | -25.45(38)* | 85.91 | 12.85 | 93.05+ | 10.76 | -19.29(22)* |

| | Men | | | | | Women | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Time 1** | | **Time 2** | | | **Time 1** | | **Time 2** | | |
| **Index** | Mean | SD | Mean | SD | t(df) | Mean | SD | Mean | SD | t(df) |
| $AUC_I$ | 1589.40 | 916.34 | 1411.95[c] | 1372.09 | 6.39(61) | 1636.99 | 759.19 | 1296.48[c] | 1318.59 | 13.11(58)* |
| $AUC_G$ | 2094.42 | 587.02 | 2188.01+ | 583.26 | -7.63(61) | 2155.01 | 551.17 | 2225.21+ | 557.10 | -6.34(58)* |
| Slope | -0.0038 | 0.0015 | -0.0034[a] | 0.0022 | -11.94(61) | -0.0041 | 0.0015 | -0.0035[a] | 0.0021 | -15.54(58)* |
| Bedtime | 0.54 | 1.28 | 0.83+ | 1.64 | -8.82(61) | 0.56 | 1.07 | 1.00+ | 1.62 | -13.87(58)* |
| DAS | 90.79 | 10.47 | 95.41 | 10.16 | -18.79(35) | 86.92 | 13.38 | 94.84 | 12.29 | -26.77(25)* |

*Note*. Units for $AUC_G$ and $AUC_I$ are reported in μg*minutes/dL; slope values are reported in μg/(dL*minutes); single time point units are μg/dL. An increase from pre- to posttest is denoted by +, a decrease is denoted by [c], a flatter slope is denoted by [a], and * $p < .0001$. DAS scores that are ≤ 97 indicate the clinical cutoff for distress.

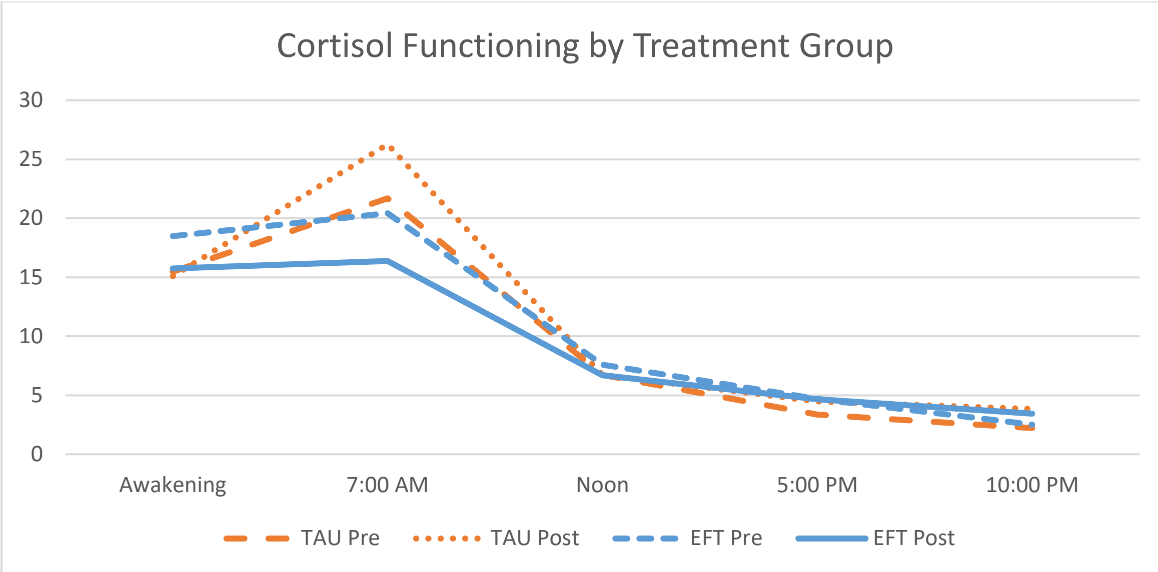


*Figure 1.* Variation in cortisol functioning between treatment groups (EFT and TAU) at pre- and posttreatment. The morning sample that was collected the following day is displayed as the first value. Units are measured in μg/dL.

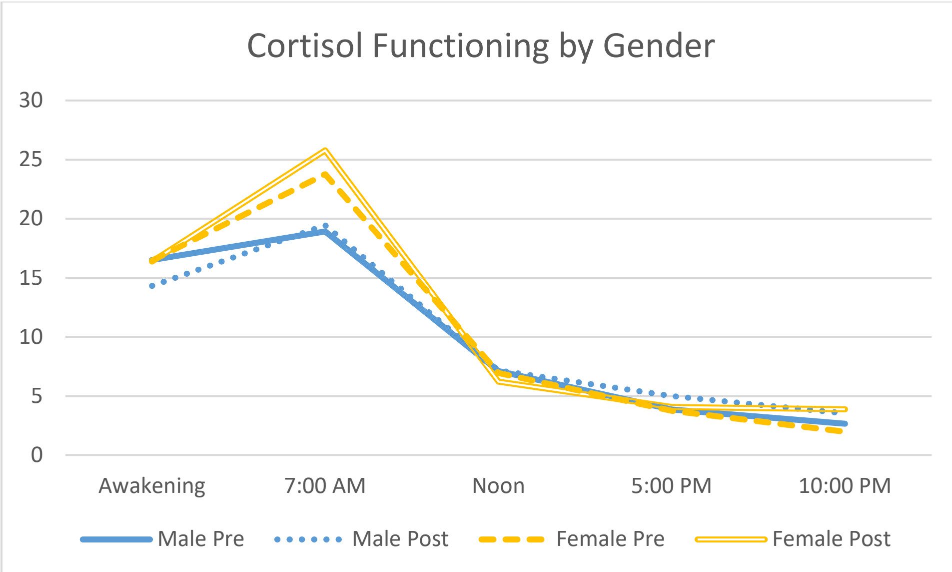


*Figure 2.* Variation in cortisol functioning between genders at pre- and posttreatment. The morning sample that was collected the following day is displayed as the first value. Units are measured in µg/dL.