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The Role of Intimate Partner Violence and Relationship Satisfaction in Couples' Interpersonal Emotional Arousal

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Abstract

To inform interpersonal models of intimate partner violence (IPV), the present study examines patterns of vocally-encoded emotional arousal during the conversations of mixed-gender couples who reported on the extent of physical and psychological IPV and degree of relationship satisfaction (N = 149). All couples completed two problem-solving discussions. Emotional arousal was measured continuously during each conversation using vocal fundamental frequency. Contrary to expectations, results demonstrated that trajectories of arousal differed based on gender, IPV, and relationship satisfaction. Within conversations, men demonstrated linear increases in arousal at higher levels of IPV, suggesting that men may either struggle to contain their emotions or use heightened emotional expression as a conflict strategy in relationships with more extensive IPV. Conversely, women exhibited different trajectories of arousal depending on the combinations of relationship satisfaction and couple IPV, except at higher levels of their own satisfaction. Specifically, when women reported being highly satisfied in their relationships, they demonstrated similarly shaped trajectories across all levels of IPV and men's satisfaction. Together, this suggests that women's higher relationship satisfaction may buffer their emotional expression, although this may not always be adaptive within the context of relationships with extensive IPV. Overall, this study offers insight into the dynamic interpersonal processes linked with relationship distress and IPV and implies the need for a more nuanced, interpersonal research agenda for IPV research.

Keywords

Intimate partner violence; relationship satisfaction; couples; emotional arousal; communication

Physical and psychological intimate partner violence (IPV) is prevalent in committed adult relationships. Approximately one in three women and men (Smith et al., 2018) report experiencing IPV during their lifetime; undoubtedly, it remains a prominent health concern in the United States. Yet, outside of the rapid proliferation of IPV research in the 1980s and

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1990s, few studies have directly examined the observed interpersonal behavior of partners in relationships marked by IPV (e.g., Cordova et al., 1993; Jacobson et al., 1994). Given that problematic couple communication and relationship distress are among the most consistent predictors of IPV perpetration (Stith et al., 2008), it is critical to understand the ways that couples with IPV interact.

Of particular interest is the process by which emotions unfold between partners during conflict. Both theory and empirical research have suggested that forms of physical and psychological IPV not involving terroristic power and control tactics (i.e., "situational couple violence," Johnson, 2008) might be the result of an out-of-control emotional escalation during which partners become increasingly less able to regulate their negative affect and subsequently "up the ante" by engaging in more verbally aggressive exchanges (e.g., yelling, hostile name-calling; Slep et al., 2015; Stith et al., 2011). Although there is consensus within the literature that such increases in hostility and negative emotionality contribute to escalating retaliation from partners (Gottman, 1998) and in some cases to episodes of IPV (Birkley & Eckhardt, 2015), IPV scholars have proposed that the emotional arousal of one or both partners may play an important role in this phenomenon. Specifically, individuals who engage in IPV not only experience greater levels of emotional arousal (Margolin et al., 1988), but also have a lower tolerance for such experiences of negative internal arousal (Jakupcak, 2003). Given this low tolerance, individuals susceptible to IPV perpetration may regulate their emotions less effectively, experience quick increases in negative affect, and subsequently feel a strong urge to eliminate their negative emotional experience. Langer and Lawrence (2009) have argued that IPV occurs in response to this emotion dysregulation, serving to help the individual decrease their negative emotional arousal.

Research supports the association between emotion dysregulation and IPV perpetration (e.g., Langhinrichsen et al., 2012; Lee et al., 2019). However, previous investigations have commonly relied on self-report, observational, or psychophysiological methods to measure emotional expression and experience among individuals who perpetrate physical IPV (e.g., Gottman et al., 1995; Jacobson et al., 1994). Among these studies, emotional responses between partners have often been portrayed as a static construct (Norlander & Eckhardt, 2005), providing either broad, descriptive information about the overall emotional context of IPV, average levels of emotional intensity, and mean probability of behavioral sequences during a conversation (e.g., Bakeman & Gottman, 1997). Although this work has contributed important insights about the role of emotions in IPV, it is limited in two notable ways. First, studies that present aggregate findings limit the degree to which inferences about moment-to-moment interpersonal processes can be drawn. Because intimate partners influence each other's emotions continuously across time (Butler, 2011), it is likely that changes in one partner's emotional arousal during conflict might be a driving force behind specific patterns of escalation that seem to characterize the interactions of couples with IPV. Thus, it is important to assess emotions in a way that captures such nuance during couple communication.

Second, studies using psychophysiological indices of emotional arousal have produced contradictory findings. For instance, Gottman and colleagues (1995) demonstrated that

increases in male-to-female verbal aggression during couple communication are associated with higher heart rate activity in men. Others have been unable to replicate these findings, instead demonstrating that such patterns may be only fitting of men with antisocial personality traits who engage in severe levels of IPV (e.g., Michonski & Babcock, 2009). These findings are further complicated by the fact that common physiological measures of emotion are invisible to the other partner, who has no access to the other person's physiological arousal. For partners to react to each other's emotions, they must be aware of the other's emotional experience in the moment. Therefore, to assess emotional arousal during interactions, it is imperative to use a measure that is (a) communicated between partners to assess how they respond to each other's arousal and (b) can sensitively capture changes in arousal as a conversation unfolds.

Fortunately, a growing body of evidence suggests that using vocal indicators of emotional distress, including fundamental frequency (f_0), can meet these needs (Weusthoff et al., 2013). f_0 is a vocal quality related to perceived pitch (Atkinson, 1978); subtle changes in an individual's f_0 can be detected by others, making f_0 a useful marker of how people perceive others' emotional experiences (Eckland et al., 2019). Because f_0 is considered a general index of emotional arousal not specific to a given emotion (Atkinson, 1978) and captures the nonverbal transmission of emotional arousal driven by involuntary autonomic processes (Gregory & Webster, 1996), using f_0 can provide unique, objective information about changes in emotional arousal relative to other channels of emotional expression. Additionally, because it can be measured continuously using only a clear audio recording, f_0 is a prime candidate for data analytic approaches that model the overall trajectory (i.e., escalation and/or de-escalation) of couples' emotions across a conversation. Examining arousal trajectories can suggest whether adaptive or maladaptive emotion regulation takes place between partners. Previous research examining emotional expression in couples indicates that containing negative emotional arousal after one or both partners express emotional distress is linked with positive relationship outcomes (e.g., long-term relationship satisfaction; Weber et al., 2020). Conversely, distressed couples demonstrate more rapid, persistent increases in negative emotional arousal during conflict and fewer instances of down-regulation (e.g., Baucom et al., 2015).

Understanding the nuanced expression of emotional arousal in partners reporting physical and/or psychological IPV can provide further clarification on how emotional dysregulation might occur within couples' conversations. Importantly, one other investigation using the same sample as the current paper has examined emotions between partners in relationships marked by IPV (Slept et al., 2021); specifically, this paper focused on partners' nonverbal and paraverbal anger expression coded by trained observers, along with self-reported anger experience. Focusing on vocally encoded arousal will add to this work by elaborating on emotional processes that are not limited to a single emotion. Given that IPV perpetration has been associated with a variety of emotions other than anger (e.g., jealousy, fear; Babcock et al., 2004), using an index of emotion associated with emotional *intensity* rather than *content* may capture aspects of communication that underlie the heterogeneous emotional experiences of those who engage in IPV.

Furthermore, to successfully model the trajectories of emotional arousal among couples with IPV, isolating the degree to which couples' emotional escalation is attributable to the experience of relationship satisfaction versus IPV is an important consideration. Couples who report IPV are more likely to be dissatisfied in their relationships (Stith et al., 2008), suggesting that some IPV may be linked to the relationship climate. Moreover, the interactions of distressed couples are frequently characterized by reciprocal expressions of negative emotion (Heyman, 2001), indicating that relationship distress, to some degree, might contribute to the negative communication of IPV couples who are unhappy in their relationship. However, studies have either (a) considered relationship distress as part of the natural context for IPV and controlled for it during analyses (e.g., Berns et al., 1999) or not included it as a primary construct of interest (e.g., Gordis et al., 2008), or (b) have traditionally divided couples into separate groups based on the presence or absence of relationship distress and IPV (e.g., Jacobson et al., 1994; Lloyd, 1990; Margolin et al., 1988). Both limit the degree to which relationship satisfaction and IPV (which are continuous in their intensity) can be understood as moderators of differences in communication. Indeed, other publications from this current sample have demonstrated that men and women engage in hostile or positive behavioral exchanges depending on the level of both satisfaction and couple-level IPV (Heyman et al., 2021). However, similar explorations of moderation have not yet been articulated for moment-to-moment expressions of emotional arousal in distressed and IPV couples. Thus, parsing the *unique* and *combined* influence of relationship satisfaction and IPV (measured as continuous variables) on interpersonal emotional arousal within couples' conflict interactions is needed and the focus of the current investigation.

Taken together, this study examines trajectories of vocally-encoded emotional arousal during the conversations of couples varying in satisfaction and IPV-extent. Based on previous studies exploring the emotional arousal of individuals who engage in IPV and the interactions of couples with distressed and/or IPV, we generated hypotheses regarding the trajectories of arousal between partners. Given that the communication patterns of couples who experience (a) IPV and (b) relationship distress share similar features (e.g., Cordova et al., 1993; Friend et al., 2017), the combination of low relationship satisfaction and high IPV-extent was predicted to have additive effects on the emotional arousal of men and women. That is, partners reporting higher IPV-extent and lower relationship satisfaction were expected to demonstrate the greatest increases in arousal and the least de-escalation during their conversations. Similarly, because relationship satisfaction has been associated with de-escalation in emotion arousal (e.g., Fischer et al., 2018), we hypothesized that partners reporting lower IPV-extent and higher relationship satisfaction would demonstrate the least escalation in arousal and the greatest de-escalation by the end of the conversation. However, despite these predictions, we recognized that men and women may also differentially respond to emotional contexts (e.g., Weber et al., 2020); thus, gender was examined as a moderator of the proposed associations among relationship satisfaction, IPV-extent, and emotional arousal on an exploratory basis.

Method

Participants

Participants were taken from a larger study of couples' interaction (Heyman et al., 2021; Slep et al., 2021). Participants were recruited via random digit dialing (Slep et al., 2006) and were English-speaking, mixed-gender couples who were living together for at least one year or were married. In the larger study, couples (N = 291) were classified into one of four cells in a 2 × 2 design that crossed relationship satisfaction (distressed vs. happy) and male-to-female IPV (present vs. absent), using the Quality of Marriage Index (QMI; Norton, 1983) and the physical IPV items on the Conflict Tactics Scale-Revised (CTS2; Straus et al., 1996). As such, the classification of couples during data gathering included (a) happy/non-IPV, (b) distressed/non-IPV, (c) distressed/IPV, and (d) happy/IPV couples. For a couple to be classified as distressed, at least one partner needed to score in the clinical range of relationship distress (QMI < 27); to be classified as happy, at least one partner needed to score above the population mean for relationship satisfaction (QMI >=37). Couples categorized in the "IPV" group reported at least two mild acts of male-to-female physical IPV (e.g., pushing, grabbing, shoving) or one severe act (e.g., punching, kicking) within the past year; couples categorized as "non-IPV" could not report more than one act of mild male-to-female physical IPV ever in the history of the relationship. Couples were excluded if one partner scored as distressed and one as happy, or if they reported no past-year IPV but more than one act of minor aggression during history of the relationship. After removing couples without video-taped conversations, the final between-groups sample included a total of 230 couples (happy/non-IPV = 85, distressed/non-IPV = 43, distressed/IPV = 73, and happy/IPV = 29). To ensure balanced representation of couples across the four groups, a random sub-sample of couples was selected for the current study: 40 couples were randomly chosen from all groups of couples except the happy/IPV group (from which all couples were included), yielding a total N of 149. Within this final sample, IPV and relationship satisfaction were analyzed as continuous predictors to include the full range of data among participants (see Data Analytic Strategy below). Demographics and descriptive statistics for the main study variables can be found in Table 1. Of note, the couples included in the present study were compared with those who were excluded on the relevant demographic variables, on IPV, and on relationship satisfaction; no significant differences emerged.

Procedure

All study procedures were approved by the institutional review board of Stony Brook University and for secondary analysis from the IRB of the University of North Carolina at Chapel Hill. Upon arrival at the lab, eligible respondents completed the Quality of Marriage Index (QMI), the Revised Conflict Tactics Scale (CTS-2; for the past year and ever in the relationship), and the Areas of Change Questionnaire (ACQ). Once finished, a research assistant reviewed their responses and determined the top areas of change selected by men and women in their ACQ responses. Three topics were chosen: one for a 10-minute warm-up conversation and two for the 10-minute problem-solving conversations analyzed in this paper. Because of the aims of the larger study, the first two topics were randomly selected from the woman's top two areas of desired change and the third was the man's top area of desired change. Couples were instructed to discuss the topics as they typically would

at home. The presentation of topics was counterbalanced to reduce the potential for order effects across couples. After finishing the full protocol, participants were paid, debriefed, and provided with a list of community resources.

Measures

Demographics—All participants completed a demographic questionnaire.

Relationship satisfaction—The Quality of Marriage Index (QMI; Norton, 1983) is a six-item measure of relationship satisfaction. Total scores on the QMI range from 6 to 45, with higher scores reflecting more positive satisfaction with the relationship. Conversion formulas from Heyman, Sayers, and Bellack (1994) were used to calculate the QMI equivalents of DAS scores. Satisfaction cut-off scores to determine group placement within the current study were based on those commonly used with the DAS, yielding a score of 27 as the cut-off for placement within the distressed groups (DAS<=97, i.e., at or below the clinical threshold for relationship unhappiness) and 37 as the cut-off for the happy groups (DAS=>107, i.e., at or above the mean for relationship happiness). The internal consistency of scores within the current sample was excellent (αs = .98 and .97 for women and men, respectively).

Intimate partner violence—The Revised Conflict Tactics Scale (CTS2; Straus et al., 1996) is the most widely used measure of IPV, with established reliability and validity. Participants indicated the frequency that they (i.e., perpetration) and their partners (i.e., victimization) engaged in specific acts during the preceding 12 months on a scale ranging from 0 (*never*) to 6 (*more than 20 times*). Using Straus et al.'s (1996) classifications, mild psychological IPV comprised the following items: insulted or sworn at; shouted or yelled; and done something to spite partner. Severe psychological IPV comprised the following items: called partner fat or ugly; destroyed something belonging to partner; accused partner of being a lousy lover; and threatened to hit or throw something. Mild physical IPV was assessed with the following items: threw an object that could hurt; twisted arm or hair; pushed or shoved; grabbed; and slapped. Severe physical or sexual IPV comprised the following items: beat up; burned or scalded on purpose; kicked; slammed against a wall; choked; punched or hit with an object that could hurt; used a knife or gun; used force to make your partner have sex. IPV impact/injury comprised the following items: broken a bone or passed out from being hit on the head by your partner during a fight; and gone, or needed to (but didn't) go, to the doctor because of a fight with your partner. Perpetration scores were calculated via item average using dual-informant scoring; that is, we calculated each person's IPV score as the maximum of their own reported perpetration and their partner's reported victimization. To examine IPV continuously as opposed to categorically, a dyadic-level ordinal variable was created with 0=no IPV, 1=mild psychological IPV, 2=severe psychological IPV, 3=mild physical IPV, 4=severe physical/sexual IPV, and 5=impact/injury due to IPV, for male-to-female and female-to-male IPV. Couple-level IPV was summed across partners, with a range of 0–10 (M = 5.33, SD = 2.94). Online Supplemental Table 1 shows a crosstab of men's x women's IPV. Frequencies from this table demonstrate that the majority of couples within the sample endorsed mild

psychological and physical IPV perpetrated by both men ($N = 88$) and women ($N = 80$), with a moderate amount endorsing impact/injury from the violence ($N = 30$).

Couple conversation topics—Conversation topics were determined via each partner's completion of the Areas of Change Questionnaire (ACQ; Weiss et al., 1973), a 34-item measure that assesses respondents' presenting complaints about their relationship. Each statement corresponds with a specific area of relationship functioning (e.g., "have meals ready on time," "spend time with me"), and respondents rate the degree of change desired from their partner in each of these areas on a seven-point scale.

Emotional arousal—Vocally-encoded emotional arousal was measured using fundamental frequency (f_0) values derived from video-recorded problem-solving couple interactions. Measured in Hertz (Hz), higher values of f_0 indicate rapid opening and closing of the vocal folds used in speech production and greater emotional arousal (Juslin & Scherer, 2005). Using Audacity 2.1.6, audio recordings from each conversation were manually segmented into separate tracks for men and women. Interfering background noises and nonverbal vocalizations (e.g., laughter, coughing) were removed from both tracks. Estimates of f_0 were then obtained at each quarter-second interval using Praat. A bandpass filter of 75 to 300 Hz was used to restrict f_0 estimates to the range of typical human speech (Owen & Bachorowski, 2007). Mean f_0 was calculated by averaging the f_0 estimates within each talk turn (i.e., time during which one person speaks) per partner. Before analysis, visual inspection of f_0 plots for each couple, as well as statistical checks and diagnostics, were used to ensure data quality.

Data Analytic Strategy

All analyses were conducted in SAS 9.4 (SAS Institute Inc., 2013) by estimating a series of multi-level models (MLMs) with PROC MIXED to adjust for the non-independence of data in couples. To include the full range of scores for relationship satisfaction and couple-level IPV in our model, these variables were entered as continuous, rather than categorical (i.e., group-level), predictors. Furthermore, because there is evidence to suggest that partner behavior differs when men versus women ask for change (e.g., Heyman et al., 2021), the model controlled for conversation initiator (man or woman).

Trajectories of f_0 were tested via two-intercept models that allow for the estimation of the effects for men and women separately. f_0 was regressed onto Time and Time^2 to examine both linear and quadratic effects of time on changes in emotional arousal for men and women, as described by the following equation:

Level 1:

$$f0mean_{tij} = M * \left(\beta_{1j} Intercept + \beta_{3j} Time + \beta_{5j} Time^2\right) + W * \left(\beta_{2j} Intercept + \beta_{4j} Time + \beta_{6j} Time^2\right) + r_{ij}$$

where i indexes the timing in minutes of the start of each talk turn, j indexes couples, and M and W are dummy codes for men and women. Level-2 random effects were included on β_{1j} and β_{2j}. Relationship satisfaction (an individual-level variable assessed for each partner) and IPV (a couple-level variable) were entered as cross-level interactions. Specifically, the time

parameters interacted with each partner's relationship satisfaction and IPV separately and in combination (i.e., interactions with time, each partner's satisfaction, and IPV). Significant interactions were probed using simple slope estimates at mean ±1 *SD* for relationship satisfaction and IPV.

Results

Results from the two-intercept growth curve models are presented in Tables 2 and 3; Figures 1 and 2 depict the growth curve plots of the significant effects for men and women. Estimates from simple slopes analyses are presented in Online Supplemental Tables 2-5. Overall, contrary to the anticipated additive effect of relationship satisfaction and IPV on f_0, the findings illustrate a series of two-way and three-way interaction effects for men and women, respectively. Due to the complexity of the results, findings for men and women are described separately below.

For men, a two-way interaction between couple-level IPV and change in f_0 emerged as significant (Table 2). Decomposition of this interaction revealed that at low levels of IPV, men demonstrated quadratic change in emotional arousal across the conversation; that is, their levels of arousal initially increased, but then reversed course and decreased to some degree by the end of the 10-minute interaction (Figure 1). However, at higher levels of IPV, only linear change was significant, such that men continued to increase continuously in arousal across the conversation.

For women, on the other hand, several three-way interactions involving relationship satisfaction and couple-level IPV were significant (Table 3). First, women's change in f_0 was significantly associated with couple-level IPV and her own relationship satisfaction (Figures 2A and 2B). Specifically, women demonstrated qualitatively different patterns of f_0 at low versus high levels of satisfaction. At low levels of her own satisfaction and less IPV (Figure 2A), women demonstrated a significant U-shaped quadratic trajectory, initially decreasing in arousal, then reversing course and increasing in arousal during later portions of the conversation. At higher levels of IPV, however, women did not demonstrate significant changes in arousal, instead sustaining stable, higher levels of arousal across the conversation. Conversely, at higher levels of her own satisfaction, women's trajectories were not different from one another (Figure 2B). Regardless of IPV level, women's quadratic trajectories of arousal trended toward significance ($p = .083$ and .084 for low and high IPV, respectively), remaining at relatively the same degree of arousal across the conversation.

Second, women's change in f_0 was significantly associated with couple-level IPV and men's relationship satisfaction (Figures 2C and 2D). At lower levels of men's satisfaction (Figure 2C), women demonstrated a significant inverted U-shaped quadratic trajectory when there was less IPV in the relationship (i.e., increasing in arousal initially, decreasing in arousal by the end of the conversation). When more IPV was reported, the trajectory of women's arousal demonstrated neither significant linear nor quadratic change; that is, her arousal remained at a stable, lower level across the conversation. Conversely, when men's satisfaction was high (Figure 2D), women's arousal adopted a significant U-shaped curve at lower levels of IPV and significant linear escalation at higher levels of IPV.

Third, women's change in f_0 was also associated with each partner's satisfaction (Table 3). Decomposition of this interaction demonstrated multiple unique patterns. Of note, at low levels of her satisfaction, women's arousal demonstrated opposite trajectories of quadratic change when accounting for low and high levels of men's satisfaction, respectively (Figure 2E). Specifically, when both partners' satisfaction was low, women's arousal increased at the start of the conversation and then decreased by the end. However, when satisfaction was discrepant (low satisfaction among women, with high satisfaction among men), her arousal adopted a U-shaped pattern; that is, it decreased initially, but then reversed course and increased significantly by the end of the interaction. Conversely, at high levels of her satisfaction, women did not demonstrate such "mirror opposite" patterns of arousal (Figure 2F). Indeed, as men's level of satisfaction increased, women showed parallel patterns of quadratic change, simultaneously increasing and then decreasing in arousal across the conversation.

In summary, results revealed that men's and women's f_0 changed differentially based on various combinations of relationship satisfaction and IPV. Men demonstrated continuous linear increases in arousal at higher levels of IPV but managed to decrease in arousal when there was less IPV in the relationship. Women's $f_{0,}$ on the other hand, was associated with multiple interaction effects—first, between each partner's satisfaction and couple IPV and, second, between both partners' satisfaction simultaneously. Across these interactions, women showed different patterns of arousal across all combinations of relationship satisfaction and couple IPV, with one exception: in the presence of her own high relationship satisfaction. When women endorsed high satisfaction, she expressed arousal in similar ways regardless of the level of IPV and men's satisfaction. However, across other combinations of satisfaction and couple IPV, women demonstrated *opposite* trajectories of arousal—particularly in the presence of either partner's low satisfaction. Notably, when *women* were less satisfied within the context of high IPV, they demonstrated stable, *higher* levels of arousal across the conversation; conversely, when *men* were less satisfied within high IPV relationships, women sustained stable, *lower* levels of arousal during conflict. Across both partners' levels of satisfaction, women who endorsed low satisfaction demonstrated U-shaped patterns of arousal when men's satisfaction was low, but inverted U-shaped patterns when men's satisfaction was high.

Discussion

The current study used a time-sensitive vocal indicator of emotional arousal to explore the effect of IPV and relationship satisfaction on emotional escalation during couples' conflict conversations. The findings are complex, yet the major patterns that evolved provide increased insight into the moment-to-moment emotional responding of these couples. Notably, trajectories of emotional arousal differed by gender. First, men's emotional expression was associated with the extent of IPV in the relationship. Specifically, at higher levels of IPV between partners, men increased continuously in arousal as the conversation unfolded. Second, women's arousal demonstrated two central patterns across multiple interaction effects involving (a) couple IPV and each partner's satisfaction and (b) both partners' satisfaction. That is, women exhibited different trajectories of arousal among various combinations of couple IPV and relationship satisfaction, *except* at higher

levels of their own satisfaction. When women reported being highly satisfied in their relationship, they demonstrated *similarly shaped* trajectories across all levels of IPV and men's satisfaction. Ultimately, these outcomes differ from our initial conceptualization of the combined effect of IPV and satisfaction on emotional arousal (i.e., additive as opposed to unique interaction effects). Yet, they raise important considerations about the degree to which these variables differentially predict emotional expression among men and women.

Primarily, our findings for men support previous research that IPV is associated with emotional escalation, and by extension, with emotion regulation. In our sample, men's continuous increases in arousal suggest that emotional expression becomes more challenging to contain in relationships with more extensive IPV. Importantly, there are two interpretive possibilities for why men do not decrease in arousal. On the one hand, in light of previous findings (e.g., Jacobson et al., 1994; Slep et al., 2021), men in relationships with more extensive IPV may lack, or struggle to access, the skills needed to interact in ways that bring their emotional arousal to a lower level. In the face of such communication, partners often cannot optimally solve problems, contain their arousal, or perform the tasks needed to negotiate difficult interpersonal situations (Fruzzetti & Worrell, 2010). Moreover, men in relationships with extensive IPV have described quickly reaching their "emotional threshold" during arguments (e.g., Stith et al., 2011). It is possible, then, that men might not only experience emotional arousal more quickly and intensely than others; the dysregulating effects of highly negative communication might also become an "absorbing state" (Gottman, 1994) and stymie their ability to implement effective response strategies during conflict, leading to further increases in arousal.

On the other hand, men's continuous increases in arousal might represent forms of emotional expression that have been previously reinforced as a conflict tactic. IPV scholars have noted that partners in situationally violent relationships often escalate to more intense, aversive behavior during conflict (e.g., aggression) in an effort to "turn off" their partner's negative communication (Slep et al., 2015). Such forms of responding are shaped over time, and in turn, partners learn to use increasingly intense behavior to exit conflict. Thus, whereas the first explanation suggests that men might not be able to access effective emotion regulation skills, it may also be that men have learned to use heightened emotional expression as a strategy during interactions with their partner. Although this study did not examine the content of communication per se, the link between communication behavior and emotional expression during couple conflict and within the context of IPV has been well documented (e.g., Baucom et al., 2020; Birkley & Eckhardt, 2015; Heyman, 2001). As such, it remains plausible that behaviors exchanged between partners with more extensive IPV (and the ways in which they are mutually reinforced) could further limit opportunities for effective de-escalation among men.

In contrast, the findings among women suggest that their experience of high relationship satisfaction may impact their emotional expression. In particular, we found that when women were very satisfied within their relationship, they were more likely to express emotions in consistent ways across the conversation. Specifically, within the context of IPV, women demonstrated overlapping trajectories that remained at stable levels of arousal regardless of the extent of IPV. Similarly, within the context of men's satisfaction, women

demonstrated quadratic changes in arousal, increasing in emotional expression during the early stages of the conversation, then reversing course and decreasing by the end; this pattern occurred regardless of how satisfied men were in the relationship. As such, women's high relationship satisfaction might be a stabilizing force for their emotional experience—even within challenging relationships marked by more extensive IPV and lower satisfaction. Relationship satisfaction has been described as a buffer against negative experiences (Coan et al., 2006). During difficult times, it can facilitate less effortful emotion regulation: Satisfied partners have been shown to demonstrate less reactivity to one another's emotional arousal and help one another decrease negative emotions over the course of a conversation (Bloch et al., 2014). Thus, women may have a greater regulatory capacity as a function of their own higher level of satisfaction and avoid escalation of their emotional arousal.

Yet, it is not clear whether this consistency in women's emotional responding is adaptive, particularly in relationships with more extensive IPV. Whereas this pattern could be viewed as a positive outcome suggestive of effective emotion regulation, it also implies a more concerning possibility: Women experiencing high satisfaction may minimize the impact of IPV and, thus, respond similarly to those in relationships with little IPV. Other investigations have found that women with higher levels of commitment to their relationship might engage in greater minimization (and even forgiveness) of IPV, particularly when these are counterbalanced by periods of positive behavior (e.g., affection) or when the IPV is not severe (e.g., Gilbert & Gordon, 2017). Thus, it may be that women's high satisfaction skews the way in which they view the relationship and the couple's IPV, in turn affecting emotional communication with their partners. However, only additional research can clarify whether this consistency in responding among women in relationships with more extensive IPV is adaptive in helping them contain their arousal or whether a different pattern of emotional responding is called for as a function of the IPV in the relationship.

In addition to the observed consistency in emotional arousal for women with high relationship satisfaction, it is equally important to consider their different trajectories of arousal when women were less satisfied. Most notably, when either partner reported lower satisfaction, women showed mirror opposite patterns of arousal as a function of IPV. That is, women expressed stable, higher levels of arousal when *they* experienced low satisfaction in relationships with more extensive IPV, but expressed stable, lower levels of arousal when *men* were less satisfied relationships with more extensive IPV. Similarly, when both partners' satisfaction was simultaneously examined, women who endorsed low satisfaction demonstrated opposite patterns of quadratic change across levels of men's satisfaction. They initially *increased* in arousal during early portions of the conversation when both partners' satisfaction was low, but initially *decreased* in arousal when men's satisfaction was high.

Thus, whereas higher satisfaction may have a stabilizing effect for emotional expression among women, when less satisfaction is experienced by either partner, their patterns of emotional expression unfold in different directions. Indeed, women have been described as the "barometers" of distressed relationships (Floyd & Markman, 1983), in that (a) they are more attuned to the emotional quality of couple interactions compared with men and thus, (b) their emotional experience is more sensitive to negative interactions (Kiecolt-Glaser & Newton, 2001). Furthermore, unhappy relationships are emotionally

dysregulating: they have great potential to impact an individual's sensitivity and reactivity to emotionally-relevant cues and make partners more susceptible to the experience of chronic negative emotions (Baucom et al., 2020). Thus, whereas their own level of high relationship satisfaction may contribute to stability in emotional responding for women, relationship distress might result in women responding in more nuanced ways as a result of the specific levels of IPV and their partner's satisfaction.

Finally, it is important to note the patterns of emotional arousal in the context of partners' low satisfaction and more extensive IPV. As noted earlier, women reported low satisfaction expressed stable levels of *high* arousal in relationships with more extensive IPV; however, when men reported low satisfaction and more extensive IPV, women expressed stable levels of *low* arousal. Understanding this finding is key, particularly in light of research suggesting that women in distressed/IPV couples are just as likely as men to engage in destructive communication during conflict (e.g., negative reciprocity, Cordova et al., 1993; Heyman et al., 2021). Interestingly, the current findings indicate that women may be caught in a delicate emotional balancing act when men are less satisfied. Women may be more skilled at recognizing the "danger zone" of conflict in the presence of their partner's dissatisfaction and thus, hold back their emotional expression to prevent further escalation of conflict. In other words, they may be acutely aware that the combination of men's lower satisfaction and the couple's tendencies toward IPV may put both partners at risk of further retaliation. This awareness, however, may be less salient when women are experiencing lower satisfaction in the relationship. Just like higher levels of arousal may become an "absorbing state" (Gottman, 1994) among men in this sample, the same may also be true for women: Less satisfied women enter into conflict at high levels of arousal and sustain this arousal across the conversation, suggesting that women in relationships with more extensive IPV and lower satisfaction may also have trouble accessing the skills necessary to de-escalate emotionally.

Taken together, our findings suggest several clinical implications. For "situationally violent couples" with low relationship satisfaction, couple therapy may be critical to reduce their experience of relationship distress and simultaneously address each partner's emotion regulation skills (e.g., Epstein et al., 2015). In addition to improving the general atmosphere of the relationship, therapists can effectively coach partners to attend to bodily cues of emotional arousal, which can be used as signals to implement emotion regulation techniques (e.g., self-soothing) before conflict gets "out of hand." Such interventions may be important for men and women respectively, particularly in light of current findings that suggest they each may struggle to contain emotions at a lower level when IPV and/or dissatisfaction are present in the relationship. Furthermore, we found that women who report high relationship satisfaction express emotions in similar ways across different levels of IPV and men's satisfaction; however, it is unclear whether this pattern of responding from women is adaptive, especially within relationships characterized by more extensive IPV. As noted earlier, such forms of emotional responding may suggest that women engage in effective emotion regulation. On the other hand, this pattern of women's responding could mean that they are minimizing the impact of IPV. Given these different possibilities, it may be especially important for therapists to complete careful functional analyses of women's emotional communication in relationships with more extensive IPV. Doing so may help not only therapists accurately assess which factors primarily contribute to women's

emotional experience and expression; it can also help determine which interventions are most appropriate for couples presenting with simultaneous high satisfaction and at least moderate IPV-extent (e.g., encouraging more emotional expression, addressing partner's perception of their IPV).

Limitations of this study must also be considered in interpreting the findings. First, we cannot confirm whether changes in detected arousal were directly related to effective or ineffective emotion regulation within the videotaped interactions. Although our interpretations of our findings are consistent with the literature on typical communication behavior and emotional expression in couples (e.g., Baucom et al., 2020), additional research should be conducted to determine how the current patterns of arousal are associated with the emotion regulation abilities of partners in "situationally violent" relationships. Second, this study examined each partner's *individual* trajectories of arousal, not mutual influence of partners' emotions on a talk-turn by talk-turn basis; thus, we cannot draw firm conclusions about the degree to which partners shaped each other's expression of arousal across the conversation. This remains an important area of future research. Third, it is important to realize that IPV was not occurring during the conversations; instead, the sample includes couples in which IPV took place at some point during the past year. Therefore, we can primarily conclude that the current patterns of emotional arousal might make couples more vulnerable to IPV—not that they are key determinants of IPV per se. Fourth, Heyman et al. (2021) demonstrated that nearly all couples with IPV met Johnson's (2008) criteria for "situation couple violence," not "intimate terrorism", and the patterns of emotional arousal found here likely are characteristic of that subset of IPV couples only. Fifth, the couples in this investigation were primarily White, middle-aged, and married and/or living together for an average of 12 to 13 years. Therefore, the current results may not generalize to couples of different racial/ethnic backgrounds or to younger couples in earlier stages of their relationship. To determine the generalizability of the current findings, replication of the current work should be conducted with a more diverse and larger sample size. Finally, the data collection was completed in 2003; although it is unlikely the relationships among emotional arousal, IPV, and satisfaction have changed in the intervening time, this should be taken into consideration.

Despite these limitations, this study makes meaningful contributions to the literature. Other investigations often have not often differentiated between relationship distress and IPV (e.g., Berns et al., 1999) and have frequently used static measures of emotion to draw dynamic conclusions about couples' interactions (e.g., Eckhardt et al., 2008). The present work explores the unique and combined effect of satisfaction and IPV among couples while using a continuous objective measure of emotional arousal that (a) is not specific to a single emotion and (b) confers benefits above traditional physiological measures of arousal (e.g., heart rate). Additionally, the current investigation provides further empirical evidence for the associations between emotional escalation and IPV and reinforces the value of examining emotion regulation within an interpersonal, rather than an individual, context.

In conclusion, despite the general agreement that relationship discord and poor communication are risk factors for IPV, our study found different patterns of emotional arousal among men and women reporting IPV and different levels of relationship

satisfaction. While the study hypotheses were not fully supported, our findings suggest IPV may be an overriding factor in the emotional expression of men, whereas women's emotional expression takes on different patterns based on their experiences of relationship distress versus satisfaction. Ultimately, using the information from this investigation, it is our hope that researchers will continue to consider interpersonal dynamics of IPV, such as interpersonal emotion regulation, as a central feature of these models and use these frameworks to guide the development of clinical tools necessary to reduce destructive communication and bolster healthy relationship functioning.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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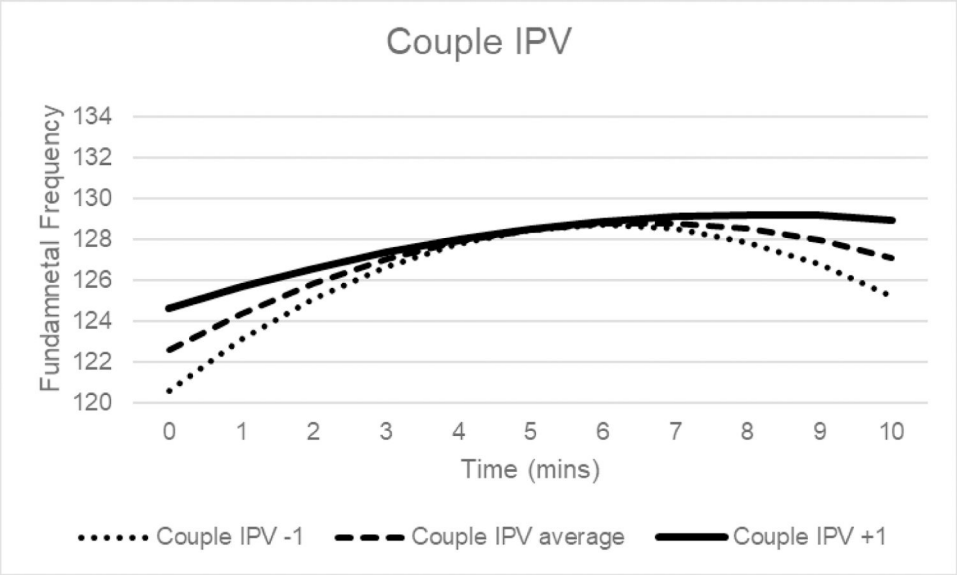

Figure 1.
Growth Curve Plots of Men's Mean F_0

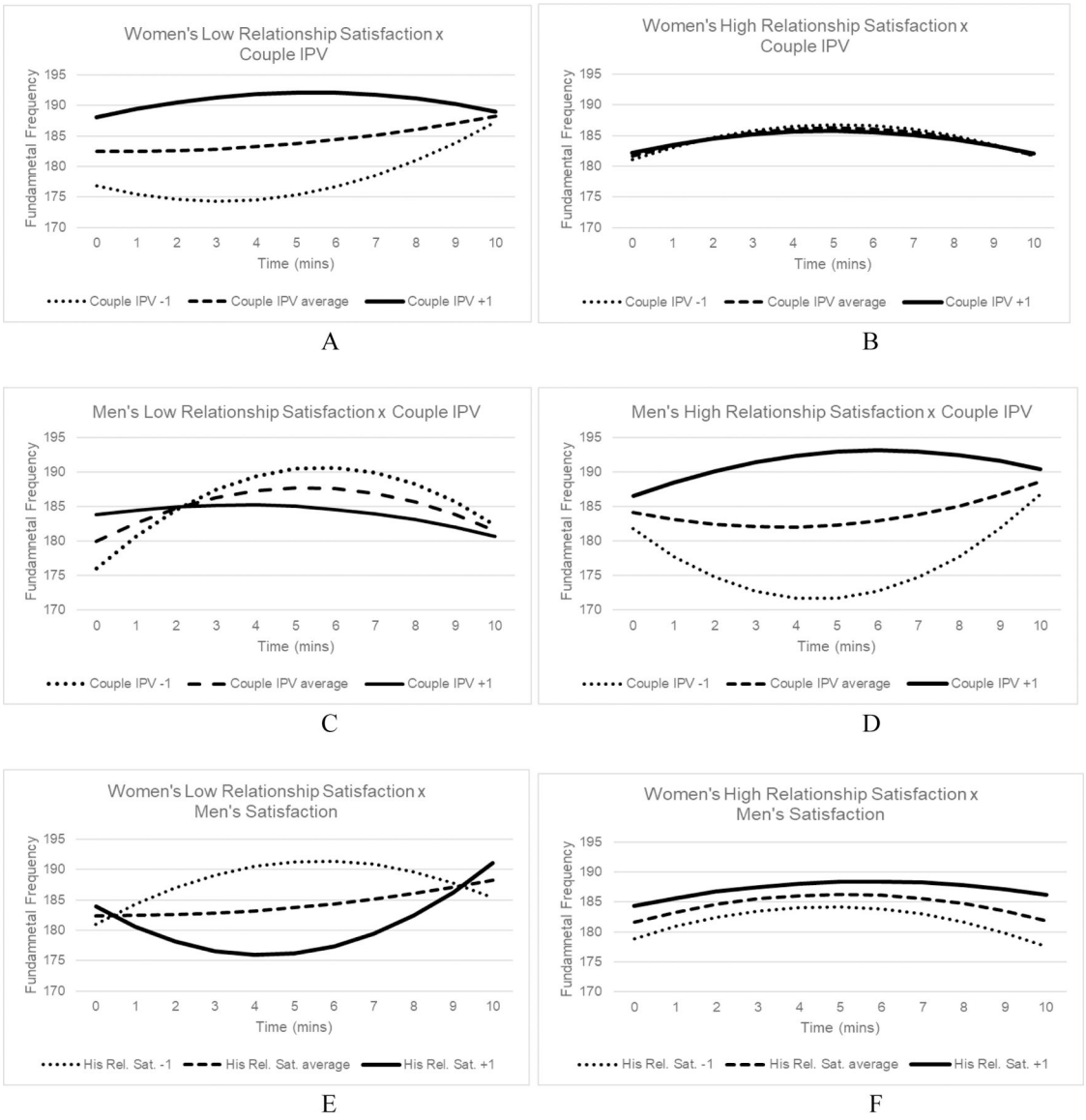

Figure 2.
Growth Curve Plots for Women's Mean F_0

Table 1

Participant Characteristics

	Men			Women		
Variable	***M***	***SD***	**%**	***M***	***SD***	**%**
Age	42.72	10.43	-	40.66	10.18	-
Years of Education	14.34	2.55	-	14.23	2.25	-
Family Income (US dollars) *	83,974.47	51,697.02	-	-	-	-
Length of Relationship (years) *	12.64	10.88	-	-	-	-
Number of Children *	2.33	1.62	-	-	-	-
Relationship Status *						
Married	-	-	92.6	-	-	-
Living Together	-	-	7.4	-	-	-
Race/Ethnicity						
Black or African American	-	-	4.7	-	-	4.7
Asian	-	-	0.7	-	-	1.3
American Indian or Alaska Native	-	-	4.7	-	-	2.0
Hispanic or Latinx	-	-	6.7	-	-	4.7
White (Non-Hispanic or Latinx)	-	-	84.6	-	-	90.6
Employment Status						
Part-time	-	-	5.5	-	-	20.8
Full-time	-	-	78.8	-	-	48.3
Student	-	-	0.7	-	-	1.3
Homemaker	-	-	0.7	-	-	14.8
Unemployed	-	-	8.9	-	-	9.4
Disabled	-	-	5.5	-	-	5.4
Relationship Satisfaction	30.35	10.12	-	28.93	11.71	-
IPV Extent *	5.33	2.94	-	-	-	-
Fundamental frequency (f_0) mean [a]	124.73	19.09	-	183.15	18.41	-

Note.

* Couple-level variable.

[a] Higher mean fundamental frequency for women represents a biological difference in voice production compared with men.

Table 2

Main Effects and Interactions Between Relationship Satisfaction and IPV on Trajectories of Mean f_0 for Men

Effect	*B*	*SE*	*p*
Men Intercept	122.61	2.36	<.0001***
Men x Conversation Topic	0.38	0.42	0.37
Men x Time	1.91	0.42	<.0001***
Men x Time^2	−0.15	0.04	0.0004***
Men x Her Relationship Satisfaction	0.12	0.27	0.65
Men x Time x Her Relationship Satisfaction	−0.05	0.05	0.32
Men x Time^2 x Her Relationship Satisfaction	−0.001	0.005	0.91
Men x His Relationship Satisfaction	0.20	0.31	0.52
Men x Time x His Relationship Satisfaction	−0.03	0.06	0.56
Men x Time^2 x His Relationship Satisfaction	0.01	0.01	0.36
Men x IPV	0.84	0.81	0.30
Men x Time x IPV	−0.33	0.14	0.02*
Men x Time^2 x IPV	0.03	0.01	0.02*
Men x Her Relationship Satisfaction x His Relationship Satisfaction	0.02	0.02	0.24
Men x Time x Her Relationship Satisfaction x His Relationship Satisfaction	−0.002	0.004	0.59
Men x Time^2 x Her Relationship Satisfaction x His Relationship Satisfaction	0.0003	0.0004	0.40
Men x Her Relationship Satisfaction x IPV	0.02	0.08	0.83
Men x Time x Her Relationship Satisfaction x IPV	0.01	0.01	0.49
Men x Time^2 x Her Relationship Satisfaction x IPV	−0.001	0.001	0.64
Men x His Relationship Satisfaction x IPV	0.02	0.10	0.87
Men x Time x His Relationship Satisfaction x IPV	0.01	0.02	0.78
Men x Time^2 x His Relationship Satisfaction x IPV	−0.0004	0.002	0.80
Men x Her Relationship Satisfaction x His Relationship Satisfaction x IPV	0.0009	0.01	0.89
Men x Time x Her Relationship Satisfaction x His Relationship Satisfaction x IPV	0.002	0.001	0.10
Men x Time^2 x Her Relationship Satisfaction x His Relationship Satisfaction x IPV	−0.0002	0.0001	0.07

Note. IPV=intimate partner violence.

*** $p < .001$,

** $p < .01$,

* $p < .05$

Table 3

Main Effects and Interactions Between Relationship Satisfaction and IPV on Trajectories of Mean f_0 for Women

Effect	*B*	*SE*	*p*
Women Intercept	182.04	2.14	<.0001***
Women x Conversation Topic	1.42	0.47	0.003**
Women x Time	0.89	0.47	0.06
Women x Time^2	−0.06	0.04	0.20
Women x Her Relationship Satisfaction	−0.03	0.25	0.90
Women x Time x Her Relationship Satisfaction	0.08	0.06	0.15
Women x Time^2 x Her Relationship Satisfaction	−0.01	0.005	0.053
Women x His Relationship Satisfaction	0.21	0.29	0.46
Women x Time x His Relationship Satisfaction	−0.21	0.07	0.001***
Women x Time^2 x His Relationship Satisfaction	0.02	0.01	0.0004***
Women x IPV	1.06	0.73	0.15
Women x Time x IPV	0.20	0.16	0.20
Women x Time^2 x IPV	−0.03	0.02	0.06
Women x Her Relationship Satisfaction x His Relationship Satisfaction	0.01	0.02	0.76
Women x Time x Her Relationship Satisfaction x His Relationship Satisfaction	0.01	0.004	0.0004***
Women x Time^2 x Her Relationship Satisfaction x His Relationship Satisfaction	−0.001	0.0004	0.0003***
Women x Her Relationship Satisfaction x IPV	−0.07	0.08	0.33
Women x Time x Her Relationship Satisfaction x IPV	−0.03	0.02	0.08
Women x Time^2 x Her Relationship Satisfaction x IPV	0.003	0.002	0.03*
Women x His Relationship Satisfaction x IPV	−0.03	0.09	0.77
Women x Time x His Relationship Satisfaction x IPV	0.10	0.02	<.0001***
Women x Time^2 x His Relationship Satisfaction x IPV	−0.01	0.002	<.0001***
Women x Her Relationship Satisfaction x His Relationship Satisfaction x IPV	−0.01	0.01	0.36
Women x Time x Her Relationship Satisfaction x His Relationship Satisfaction x IPV	−0.001	0.001	0.31
Women x Time^2 x Her Relationship Satisfaction x His Relationship Satisfaction x IPV	0.0001	0.0001	0.23

Note. IPV=intimate partner violence.

*** $p < .001$,

** $p < .01$,

* $p < .05$